Railway Mechanical Engineer

FOUNDED IN 1832

as the American Rail-Road Journal, with which are also incorporated the National Car Builder, American Engineer and Railroad Journal and Railway Master Mechanic. Name Registered, U. S. Patent Office

Published on the second day of each month

Simmons-Boardman Publishing Corporation

1309 Noble St., Philadelphia, Pa., Editorial and Executive Offices
30 Church Street, New York, and 105 West Adams Street, Chicago

SAMUEL O. DUNN, *Chairman of Board, Chicago*

HENRY LEE, *President, New York*

ROY V. WRIGHT, *Vice-Pres. and Sec., New York*
FREDERICK H. THOMPSON, *Vice-Pres., Cleveland*
ELMER T. HOWSON, *Vice-Pres., Chicago*
FREDERICK C. KOCH, *Vice-Pres., New York*
ROBERT E. THAYER, *Vice-Pres., New York*
H. A. MORRISON, *Vice-Pres., Chicago*
JOHN T. DEMOTT, *Treas. and Asst. Sec., New York*

Cleveland
Terminal Tower

Washington
1081 National Press Bldg.

ROY V. WRIGHT, *Editor, New York*
C. B. PECK, *Managing Editor, New York*
E. L. Woodward, *Western Editor, Chicago*
H. C. WILCOX, *Associate Editor, New York*
J. L. STOVER, *Associate Editor, New York*
ROBERT E. THAYER, *Vice-Pres. and Business Manager, New York*

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.) and is indexed by the Industrial Arts Index and also by the Engineering Index Service.

Index To Volume 116
1942

INDEX, 1942

VOLUME 116

* Illustrated article; § editorial; † short, non-illustrated article or note; ‡ communication; ° competition article.

* Illustrated article; § editorial; † short, non-illustrated article or note; ‡ communication; ° competition article.

D

E

* Illustrated article; § editorial; † short, non-illustrated article or note; ‡ communication; ° competition article.

F

G

H

I

J

K

L

* Illustrated article; § editorial; † short, non-illustrated article or note; ‡ communication; ° competition article.

* Illustrated article; § editorial; † short, non-illustrated article or note; ‡ communication; ° competition article.

* Illustrated article; § editorial; † short, non-illustrated article or note; ‡ communication; ° competition article.

Personal Mention

* Illustrated article; § editorial; † short, non-illustrated article or note; ‡ communication; ° competition article.

* Indicates photograph.

Personal Mention—Obituaries

Supply Trade Notes

* Indicates photograph.

Supply Trade Notes—Obituaries

* Indicates photograph.

The inclusive page numbers of each 1942 issue of the *Railway Mechanical Engineer* are as follows:

January	1- 42	July	287-328
February	43- 90	August	329-366
March	91-130	September	367-406
April	131-198	October	407-444
May	199-240	November	445-510
June	241-286	December	511-550

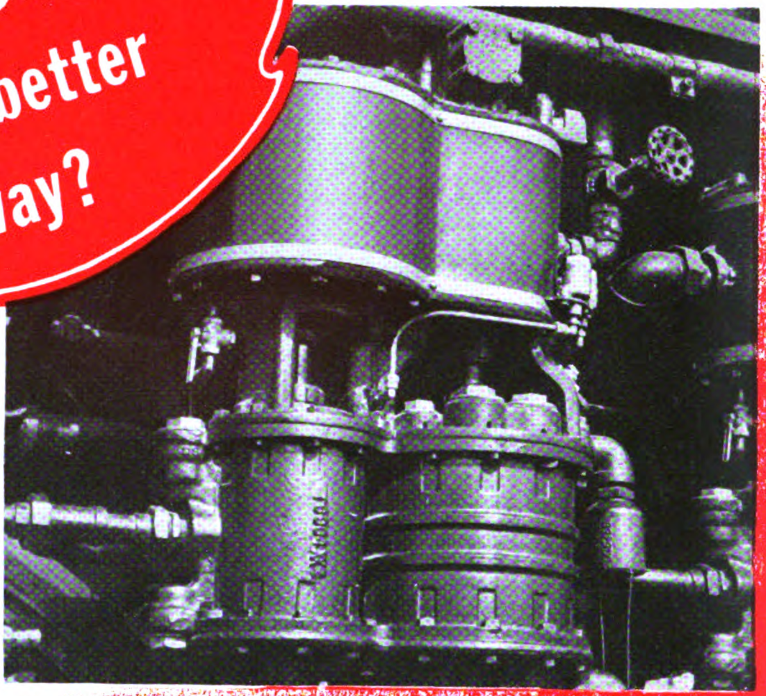
January 1942

Railway Mechanical Engineer

FOUNDED IN 1832

Published monthly by Simmons-Boardman Publishing Corporation, 1309 Noble Street, Philadelphia, Pa. Entered as second-class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, $3.00 for one year, U. S. and Canada. Single copies 35 cents. Vol. 116, No. 1.

Do You Clean COMPRESSORS this easier, better Oakite way?



How leading roads save money on this job!

If you are looking for methods that many leading roads are successfully utilizing to increase operating efficiency and establish maintenance economies, investigate what dependable Oakite cleaning materials and methods can do for your road. For example, by cleaning air compressors the safe, thorough Oakite way, you can definitely count on securing (1) greater safety, (2) time saved, (3) superior results, and (4) lower cost.

Carbon deposits are thoroughly, speedily removed from ports and cages. There are no obnoxious fumes . . . none of the hazards present when either lye or caustic is used. Beyond that, you can do the job in far less time . . . do it without dismantling compressor! Let us prove this to you. Write today . . . no obligation.

OAKITE PRODUCTS, INC.
46 Thames Street, NEW YORK, N. Y.
Representatives in All Principal Cities of the United States and Canada

OAKITE
TRADE MARK REG. U.S. PAT. OFF.
RAILWAY SERVICE DIVISION

"KEEP POWER ROLLING"

ASK US ABOUT

Cleaning Heating and Cooling Coils of Air Conditioning Equipment Without Dismantling

•

Steam Cleaning Motion Gear

•

Cleaning Driving Box Lubricators

•

Exterior Coach Washing

•

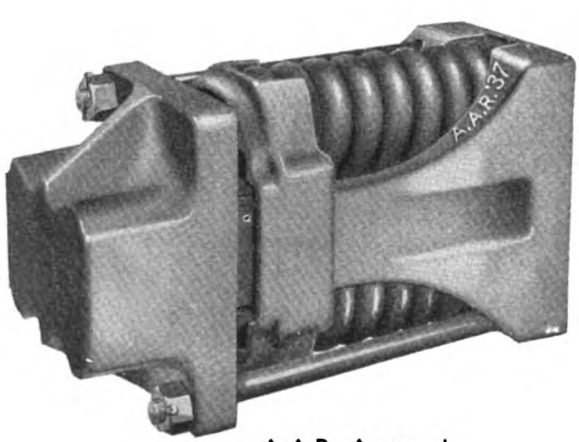
Safely De-Scaling Injectors and Feedwater Heaters

NATIONAL K-4
Friction Draft Gears

designed especially for high speed passenger train service to assure smooth riding at all speeds.

The spring and frictional resistance are so proportioned that the light as well as the heavy blows are cushioned.

These gears are of standard dimensions, and require but one follower.



A.A.R. Approved

NATIONAL M-17-A

Friction Draft Gears are designed to afford the greatest protection to cars and lading, against the tremendous shocks sustained in switch-yard and main line operation of long trains and heavy loads, common to today's freight traffic.

Strong - Durable - Smooth acting.

NATIONAL MALLEABLE AND STEEL CASTINGS CO.
General Offices: CLEVELAND, OHIO
Sales Offices: New York, Philadelphia, Chicago, St. Louis, San Francisco
Works: Cleveland, Chicago, Indianapolis, Sharon, Pa., Melrose Park, Ill.

The Mechanical Engineer and

Defense Transportation

IN a symposium dealing with the transportation phases of the national emergency, conducted during the annual meeting of the A. S. M. E. on December 4, 1941, under the sponsorship of the Railroad Division, many problems of substitution and reclamation of materials to meet the shortages of supplies available for civilian use were discussed, and ways in which the mechanical engineer can assist the railroads were suggested.

Both morning and afternoon sessions were devoted to the symposium, the former under the chairmanship of A. I. Lipetz, consulting engineer, American Locomotive Company, and chairman of the Executive Committee of the Railroad Division, and the afternoon session under the chairmanship of William H. Sheehan, assistant vice-president, sales, General Steel Castings Corporation, a member of the Executive Committee of the Railroad Division and chairman of its Meetings and Papers Committee. The morning session was addressed by William C. Dickerman, chairman of the board, American Locomotive Company, and Col. C. D. Young, vice-president in charge of real estate, purchases and insurance, Pennsylvania. The afternoon session was addressed by Ralph Budd, president, Chicago, Burlington & Quincy, and at that time commissioner, Transportation Division of the Advisory Commission, Office for Emergency Management, and Charles H. Buford, vice-president, Operations and Maintenance Department, A. A. R.

In this article are presented summaries of the addresses and discussion.

"How Can Mechanical Engineering Assist Railroads in the National Emergency?" the subject of addresses and discussion at the Railroad sessions of the A.S.M.E. annual meeting

Budd Emphasizes Need for Standardization

Suggests bringing out designs of a few types of steam locomotives which will provide for all conditions

Ralph Budd

"Two different spheres of activity have been suggested within which you can assist in the defense effort," said Ralph Budd, in opening his talk at the beginning of the afternoon session. "The first is through more rigid standardization of equipment and the second is through the use of substitute materials instead of those ordinarily used, but now needed in other defense work. The two ideas are seemingly contradictory and in some respects they are. Standardization is a normal and continuing process, while substitution to a large degree is of an emergency character and we sincerely hope quite temporary. Standardization makes for uniformity of shape and sizes; substitution does the opposite. Standardization increases economy and efficiency, while with some exceptions substitution results in higher costs and less efficient operation. The common and compelling factor is the present national emergency and the consequent necessity to use as little scarce material as possible and in the way which will enable mills, factories, car builders, and locomotive builders to work to best advantage. The dual character of this appeal to the ingenuity and skill of mechanical engineers should be kept in mind in considering the extent to which normal engineering procedures may be modified during this abnormal period."

Cites Railway Record in Car Standardization

Continuing his discussion of standardization, Mr. Budd pointed out the large number of parts of freight cars which have been standardized. He listed 12 parts or dimensions of parts of trucks, 17 parts, materials and fastenings of car bodies, and 12 others applying to box cars only, which are now standard, and emphasized the importance with which he regarded the reduction to a small number the different types of freight cars, which the railroads have accomplished through the Association of American Railroads. Orders for small lots of cars, he said, would be added to other orders of substantial quantity placed by other railroads for similar equipment, and that an order of 1,000 cars or less should not be placed with more than one builder. When necessary, he said, odd sizes of plates and shapes will have to be used and that the railroads had agreed to this, even though he understood that it would add approximately 350 lb. more steel per car.

"The ideal locomotive assignment on a large railroad," said

Mr. Budd, "is to have the capacity of the locomotive so adapted to the grade line that the heavier power on the steeper grade districts will permit the handling of a train of uniform tonnage the entire length of the line. In other words, the locomotives serve to flatten out the humps and hollows of the grade line. This has been worked out with great success on some of the trans-continental routes with the result that on one large road, for example, a 5,000-ton train is handled from the West Coast to the Great Lakes without double heading and by using helper engines only in the mountains. The sole change in tonnage coming across the country is in filling out to 6,000 tons on the last 500 miles of the run across the prairies. Locomotives which are best adapted to a particular railroad might not be best suited to other transcontinental lines or to the shorter railways, but the problems there presented are generally similar."

Mr. Budd suggested that it should be possible to bring out designs of steam locomotives which would eliminate all but a few types and provide the necessary tractive force and speed for almost any circumstance. An impartial study along these lines he considered to be feasible and desirable, perhaps to be conducted by the locomotive builders.

"The variety of sizes and other characteristics might follow somewhat the idea which has been worked out in the field of Diesel-electric locomotives in order to get the benefits which come from mass production," he said.

A National Aspect of the Problem of Materials

Although it is a matter about which Mr. Budd did not believe mechanical engineers can do anything, he mentioned the importance of allocating "enough material to our transportation facilities to keep them in good condition and to make such additions as are necessary to handle the increasing traffic." In the narrower sense of doing the best with what they have, he said that the transportation agencies needed no defense, that the record spoke for itself. "The broader problem of doing the best with what we as a nation have at our disposal," Mr. Budd continued, "is one of ultimate policy. A part of that policy is to say how much shall be assigned to transportation. Obviously, it would not be making the best use of what we have if transportation, which is now in balance with production, should be thrown out of balance by denying it needed material and assigning so much to the production of other things that, when produced, they cannot be transported."

What Other Forms of Transportation Are Doing

Reviewing the situation of the five forms of transport, Mr. Budd said that the railroads, which handle about two thirds of the nation's tonnage, owned 1,641,540 freight cars on October 1, 1940, and 1,675,630 on October 1, 1941. The railway industry, he said, felt that it should be allocated enough material to keep up the existing plant and increase freight-car ownership to 1,800,000 cars by October 1, 1942. This, he said, would require the building of about 154,000 cars during the twelve months and the locomotive program called for about 1,000 locomotives in the same period. "Work on the new car and locomotive programs is being delayed by shortage of material," he said.

Highway trucks are handling more traffic than ever, he said, and the production of more than one million trucks is planned in 1942, and he believes they will be needed. Buses, he said, are the hardest hit of any public carrier. The elimination of aluminum lost a large part of the early deliveries in 1941 and using this exceptional period as a standard is working a great injustice in the allocations for 1941 and 1942. "The need of more bus service in many localities and plants on account of national defense activities," Mr. Budd continued, "is very great and it is hoped that recognition will be given that industry in the public interest."

Automobiles, he said, account for perhaps 90 per cent of all passenger miles. There are about 28,000,000 of them and production in 1940 and 1941 will be about 7,000,000. About half of the use is considered to be for business and half for pleasure, he said.

Down the Great Lakes, on which about 80 per cent of inland waterway tonnage is handled, approximately 80,000,000 long tons of iron ore will have moved during the 1941 season. Building 20 or more boats has been authorized, he said.

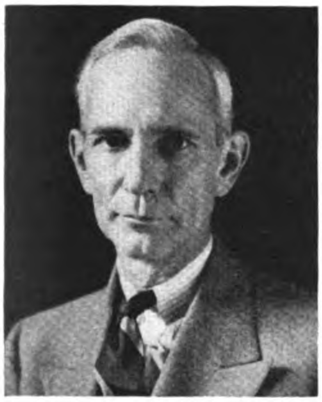
Pipe-line traffic is increasing and Mr. Budd said that the only pipe line which has been denied material is that from Texas to the New York area.

Commercial airways, he said, will be allowed to add 228 transport planes, 112 of which have been assigned to the various operating companies.

"Making the best use of what we have," Mr. Budd concluded, "cries out for a broad impartial survey and the adoption of a wise policy. This would lead to a balanced production in which no type of transportation will be favored, or slighted, or forgotten."

Cautions Against Too Rigid Standardization

Colonel Young urges exercise of generous amount of common sense and ingenuity in the emergency



Col. C. D. Young

"My remarks," said Colonel C. D. Young in opening his discussion, "deal almost entirely with the old adage which admonishes us to cut our suit according to the cloth at hand.

"You are probably all aware of the opinion generally held by the average layman that the mind of the engineer is almost completely inflexible. As an engineer myself, possibly I have been guilty of some uncomplimentary thoughts about the inability, or at least reluctance, of the fraternity as a whole to change with changing economic conditions.

"While wholeheartedly favoring adherence to standards which have been adopted as the result of years of experience in research I want to emphasize the fact that a national emergency compels us to use a generous amount of common sense and ingenuity in the way we apply the results of the work of this body and of other engineering societies." In the emergency Colonel Young commended to engineers generally the Army concept of engineering, quoting several excerpts from training regulations and army manuals as illustrations. Thus:

"The guiding thought of a military engineer engaged in road or bridge work should be that expediency is the rule and standard civilian practice the exception.

"Permanent construction beyond apparent needs is not sought, although a fair degree of permanency is often attained through the necessity of making the work strong enough to bear military loads and durable enough to keep maintenance within reasonable limits."

Again, under Construction in War:

"Construction duties place on engineer officers the heavy responsibility (as well as the disagreeable duty, at times) of limiting the use of materials to the bare necessities in order to economize, not only on the materials themselves, but also on the transportation needed to haul them."

From the basic field manual, Colonel Young quoted the following as to the engineer's personal qualifications:

"Every effort should be made to increase interest by the employment of training expedients.

"The success of engineer missions will often depend upon your own engineering skill, knowledge, initiative and resourcefulness."

Limited Number of Designs, as Applied to Freight Cars, Not Practical for Steam Road Locomotives

In discussing standardization Colonel Young commented on the fettish which those outside of the railroad industry make of standardization of equipment in the national emergency, urging that standards be established, followed blindly. He pointed out that the number of designs of freight cars from which orders will be placed had been greatly reduced by the Association of American Railroads. "I do not believe," he said, "that this theory, when applied to steam road locomotives, is as practical and sound on account of the varying conditions of topography and restricted clearances on the different railroads in different sections of the country; and it is, therefore, not entirely practicable to use the same sizes or weights of locomotives on all railroads without interfering with efficiency of operation.

"However, I believe that during the national emergency the practice heretofore followed by many railroads of purchasing small lots of steam locomotives to individual designs should be discontinued. Not only should no new designs be started during the period of the emergency, but small locomotive orders should be consolidated into larger lots of a single existent design which would make speedier and more economical production. We could thus avoid new dies, fixtures, patterns, etc., as well as the time that would be consumed in engineering manhours for each particular new design."

Colonel Young pointed out that at the present time, because of the difficulties experienced in securing planned schedules for equipment and maintenance needs, substitutions have been made on the railroad with which he is associated, "practically none of which could have been accomplished without the initiative and resourcefulness of practical engineers in charge of the work." As examples he cited the substitution of cast iron for steel in specific cases; the substitution of plain carbon steel for copper-bearing steel; the substitution within proper limitations of Bessemer for open-hearth steel; the acquisition of surplus steel ingots made for a foreign government (but not exported) and arranging for the rolling of them into car plates. He referred to the use of welding in place of riveting as an example of changing methods of construction which have been done wherever necessary.

In passenger-car work he said that substitutions of plastics had been made in trimming and interior fittings because of the scarcity of other materials, and that these seem likely to become permanent after the present emergency. "Intensive research," he said, "is necessary under these conditions in order that the engineer may have the proper background to determine in his own mind how far he may go in changing his practice as to materials and design to obtain the equivalent essential to the service. Research at this time should be continuously looking forward to that day when time and labor may be saved in plant improvement that there may be a cushion some time in the future when the present activity of war construction and manufacture has suddenly been cut off. If this work is intelligently done now, it will pay dividends in the future."

Colonel Young referred to the Bureau of Industrial Conservation which is under consideration for inclusion within O. P. M. It might well, he said, attack obsolete and uneconomical municipal codes and regulations.

"There is, as you know," he said in closing, "a stormy gulf between the complacent procedure of peace-time operations and the powerful drive against time which war thrusts upon us—a gulf which is not crossed without discipline and skill. With the conditions under which we are now living most of our former objectives must be forgotten—in fact, so completely forgotten that no pressure from any class or group will make us hesitate in taking up the new line of work, meeting frankly and courageously the mental and physical confusion which inevitably follows a change of this magnitude and then turning that confusion into orderly efforts along new lines.

"The changes will affect the different industries in varying degree. It is probable that they will be least violent for the utilities, communications and rail and highway transportation. For those industries the change will be chiefly in providing for increased volume of business.

"The correct solution of any problem depends upon a true understanding of what the problem really is. In this case, it must be understood correctly by a large number of people—in fact, all industry must have a common understanding of the things we are working for."

The Next Year's Freight-Car and Locomotive Needs

W. C. Dickerman discusses probable increases in traffic volume—Doubts that materials to build all equipment needed will be available

W. C. Dickerman

William C. Dickerman made a broad survey of the probable needs of the railroads for freight rolling stock and motive power, to meet prospective traffic requirements in 1942. After a careful study of the various estimates of national income and industrial production made by experts in government as well as private agencies, Mr. Dickerman said "we believe that the index of industrial production may approximate 156 for the full year of 1941, and average in the vicinity of 175 in 1942. This would represent an increase of 12 per cent in 1942 over the average for 1941."

"National income in 1941 is estimated to be 19 per cent above 1940, and in 1942 it is expected to increase 17 per cent over 1941. Part of the estimated increase for 1942 is based on an anticipated increase in the general price level. An estimate of 1942 national income, in terms of 1941 prices—showing a gain of 7 per cent—may not be too far off.

"Now let us examine the carloading picture with these estimates in mind. It seems indicated that total carloadings in 1941 will be about 42 to 43 million, or about 16 to 18 per cent above the 1940 total. And in 1942, the total would be between 46 and 47 million, roughly 10 per cent above the 1941 figure."

Material Needed for New Freight Cars

In estimating the number of cars needed to carry this load, Mr. Dickerman referred to the program of 1940 to increase total freight ownership from 1,646,000 cars on July 1 of that year to 1,700,000 by October 1, 1941, which fell short of the goal by about 24,000 cars because of the shortage of materials, and cited the further proposal made early in 1941 to increase freight-car ownership to 1,800,000 by October 1, 1942, calling for 100,000 more new cars than were included in the proposed 1941 ownership. To this he added the shortage of 24,000 cars in the 1941 program and an additional 30,000 cars to take care of retirements during the coming year, making a total of 154,000 new cars required to meet the October 1, 1942, goal. The requirements of materials (in tons) for 154,000 freight cars he set forth as follows: Plates. 827,750; shapes, 654,500; sheets, 223,300; bars, 84,700; forgings, including axles, 327,250; steel wheels (one-half), 207,900; cast-iron wheels (one-half), 231,000; steel castings, 554,400; all other materials, 277,200—a total of 3,388,000 tons of material, including 554,000 tons of steel castings. "In view of the great need for steel castings in connection with the manufacture of ordnance," said Mr. Dickerman, "finding and allocating this requirement is going to be a real job."

"During the first ten months of 1941 the average number of cars installed monthly was about 6,500. In October it was nearly

9,000. Now, if the October rate, which is the highest to date, is not stepped up during the remaining eleven months, we may expect a shortage of at least 45,000 cars in the programmed ownership of 1,800,000 cars on October 1, 1942. And if the average is no better during the next eleven months than it has been during the first ten months of this year, then we may expect the program to fall short of the goal by 75,000 cars."

A Minimum of 1000 Locomotives at Home — Over 300 for Export

Taking up the need for more motive power, Mr. Dickerman said that it was extremely difficult to use "an overall ratio" between the number of freight-car loads and the number of locomotives required, and that definition of future requirements for additional locomotives must depend upon the requirements of the individual carriers. He also reminded his audience that the defense program has "broadened the locomotive building industry's structure to include the building of tanks, gun carriages and other articles of ordnance and defense." This burden, he said, must be borne in mind in any projected plan of locomotive building.

"Total October shipments of 104 units, including exports, from manufacturers and railway shops were higher than any month this year," he said. "On November 1 of this year the total backlog of locomotives ordered and undelivered including railway shops, was 985 units. Of these, 311 were domestic steam locomotives, of which 267 were on order with manufacturers. Under present manufacturing conditions this represents a substantial part of available shop capacity.

"On November 1, 1940," said Mr. Dickerman, "unfilled orders totaled 295 locomotives, of which 137 were domestic steam locomotives, including 125 on order with manufacturers. And foreign orders this November totaled 77, compared with 26 last year.

"The number of locomotives available for service increased from 35,243 on November 1, 1940, to 37,530 on November 1, 1941, which represents a gain of 2,287 units. During the same period locomotives actually in service increased 2,803 units, going from 33,126 last year to 35,929 on November 1 of this year."

Pointing out that on November 1 last, there were 2,377 fewer locomotives awaiting repair than a year earlier, Mr. Dickerman thought that a large number of the 3,778 remaining unserviceable units were old locomotives which could not be repaired satisfactorily and said a survey would be required before a definite judgment could be formed. He said that "it now looks as though the minimum number of locomotives which builders will be asked to deliver in 1942 would total 1,000—half steam and half Diesel-electric. This means that orders for steam locomotives will have to be increased by about 200 units, since the backlog now numbers only a little over 300 units, many of which will be delivered by December 31. Orders for new Diesel-electric will probably not be particularly large, since the backlog is more than 500 units.

"In addition to supplying domestic requirements, it already appears that the builders of steam locomotives will have to provide for more than 300 units for export. Of this number, 33 will go to the Mexican railroads (with American Locomotive and Baldwin Locomotive each supplying about half). There will be 20 units for the Yunnan-Burma Railway (supplied by American Locomotive) and up to 250 for export under Lend-Lease provisions. These will probably be used in Egypt, filling the deficit left by motive power shifted to the Near East for transporting war materials to Russia. And the materials for manufacturing these units might receive priority over domestic requirements."

In considering the course of future action, Mr. Dickerman said that, first, was the "absolute necessity for immediate and continued, complete and unselfish-cooperation of all concerned with transportation, and, second, the necessity that materials be made available on schedule to the equipment builders. He expressed doubt, however, that all of the materials needed would be available and that we must learn to do "the best we can with what we can get and with what we already have."

Speaking of 1943, Mr. Dickerman said that traffic conditions then are largely unpredictable but he believed that the burden would undoubtedly increase over the 1942 level if the war continues. "And one possible solution of the situation at that time," he suggested, "may be not merely the freezing of locomotive designs, but the restriction of designs that will be made available. This is a likelihood which all of us should be turning over in our minds now."

Buford Discusses War-Time Standardization and Post-War Competition

New fleet of cargo ships and expanded airplane-building capacity among war-created conditions affecting roads after peace is restored

C. H. Buford

Charles H. Buford recalled reports of meetings of railway mechanical officers which were held more than 70 years ago following the civil war.

"As a result," he said, "we have the standard gage of track on the American railroads, and for more than 70 years groups of engineers from many railroads have been conferring and working together to bring about uniformity and interchangeability in parts of railroad cars and other facilities. The results of their efforts are evidenced by the free interchange of equipment which prevails in this country today."

There is, he said, a constant urge to continue the program of uniformity commonly called standardization. He considered the word "standard" unfortunate, however, because most people think that it refers to something which will not or cannot be changed. "My conception of a standard of today," said he, "is the accepted or established rule or model of today and railroads should and will change models wherever necessary to improve the railroad plan. This flexibility in railroad methods is absolutely necessary and will be readily apparent to you from some recent tests of axles for freight cars."

He referred to tests of a hollow axle which suggested to him that it might replace the solid type and that it might be found possible to develop an axle of uniform outside diameter, by varying the thickness of the walls, for cars of, say 50 and 70 tons. The bearings would then be interchangeable for different capacity cars which he thought should reduce manufacturing costs and store stocks.

Such a change he said would be made only after exhaustive laboratory and field tests had proved the merits of the new type "because the railroads place safety above everything else."

Roller Bearings for Freight Cars

"When I speak of the possibility of a standard size bearing for a standard outside diameter hollow axle for freight cars," continued Mr. Buford, "some of you no doubt wonder if I am referring to a roller bearing for freight cars. I know some people are asking why the railroads continue the use of friction bearings on freight cars, and they are invariably referring to an advertisement that recently appeared in newspapers and magazines which broadcast much misleading information. Among the statements made was one to the effect that present freight cars are obsolete and that the railroads propose to build many more thousands of obsolete cars, and all that is needed to modernize the fleet of 2,000,000 railroad and privately owned cars is to put roller bearings under them.

"A change from friction to roller bearings for freight cars is a change in a standard and deserves consideration by mechanical

men because of the publicity given the question and the implication that the change should be made at once."

Mr. Buford questioned that there would be any considerable advantage in roller bearings at train speeds of 80 to 100 miles per hour and took up the effect of roller bearings on freight yard operation.

"The movement of a car on a track with a descending grade," he said, "is governed by the force of gravity, weight of the car, the speed at the start, friction of bearings, and other resistances and the degree of slope of the track. The temperature at the time the move is made is of importance with friction bearings. All of these elements are considered, and hundreds of millions of dollars have been spent in this country for building yards that are properly designed for manual or mechanical control of cars while being switched. Millions of dollars are spent annually to maintain these yards with tracks on the proper grades to best handle the switching of cars with friction bearings. Many expensive changes would have to be made in railroad switching yards before we could consider the universal use of roller bearings under freight cars. In fact, as the plant stands today, it appears to me that if you could wave a magic wand and put roller bearings under freight cars right now, the entire railroad plant in this country might be seriously crippled within 48 hours."

Mr. Buford referred to the suggestions that the railroads have a standard car and a standard locomotive and that they redesign parts of the equipment so as to minimize the use of certain critical materials such as nickel. He told of the proposal of the Car Construction Committee approved by the General Committee of the Mechanical Division that during the emergency the railroads adhere to a limited number of selected types of box, auto-box, hopper, gondola and flat cars,* which has been adopted by the A. A. R., and pointed out the impracticability of a standard steam locomotive because of differences in physical characteristics of operating territory, clearances, load limits, fuel supply and traffic. "This situation has been met, however," he continued, "by the General Committee of the Mechanical Division unanimously agreeing that during the emergency, locomotives should be built only to existing designs where the engineering is completed and where patterns, dies, etc., are already available. The locomotive builders will contribute to this program by the exchange of plans, engineering data, and patterns, and will fabricate for each other material entering into locomotive construction in order that maximum locomotive output be obtained."

Mr. Buford said that the railroads had been told to figure on the bulk of the steel for freight cars in sheets 48 in. wide and under with a limited tonnage probably available in 60-in. and 70-in. widths. The Committee on Car Construction has analyzed various designs, he said, and prepared detailed sketches showing a recommended method of construction using plates not wider than 48 in. which have been approved by the General Committee of the Mechanical Division and are being sent to members and car builders so all interested parties will understand how to utilize these sheets.

Among the critical materials, a shortage of which has created problems for the railroads, he cited nickel steel which will no longer be furnished for the construction of new riveted boilers. He said that the railroads would use carbon steel for new locomotives during the emergency, but that consideration would be given to building a few more fusion-welded boilers if material can be obtained and the Interstate Commerce Commission approves. A supply of low-carbon nickel steel for locomotive bed castings, axles, rods, motion work, and other items for both repairs and new construction, and steel plates and rivets for repairs on existing locomotive boilers constructed of nickel steel, he expects to be available to the railroads.

He said that the railroads had also considered the substitution of wood and the increased use of various alloy steels in freight-car construction; the wood offered no advantage and it is impossible to obtain the alloy steels for building freight cars.

Effect of the Emergency on Post-War Railroads

"The temporary conditions facing us call for thought as to what mechanical engineers can do to help the railroads, not so much in the present emergency as to what they can do to help the railroads meet conditions after the emergency is over," said Mr. Buford in conclusion. "Consider what is happening today. Our government is building an enormous fleet of cargo-carrying vessels. Is it not probable that they will be operated in coastal and intercoastal service, with or without government subsidy, after this war?

"The government is financing a tremendous expansion program for the construction of facilities to manufacture airplanes. Is it not likely that after the war these facilities will turn to the production of commercial airplanes and that the planes will be maintained by government subsidy?

"A move is now under way to get national legislation that will take from the states the right to specify the weight and length of loads that can be hauled over their highways. This is designed to permit more profitable operation of privately owned commercial vehicles on the highways.

"I am not giving you this picture for the purpose of debating the merits of the case, but rather to indicate to you that the railroads will have a real problem after this emergency is over. If they continue to function as a private industry, which they certainly should do, they must provide cheaper transportation to meet the kind of competition to be expected."

A Summary of The Discussion

Of more than a dozen speakers that took part in this forum the idea of the necessity of using existing car and locomotive designs for the new equipment of the immediate future was expressed by half of the participants. In outlining the value of this idea Ralph Johnson, chief engineer, Baldwin Locomotive Works said in part, "as the emergency requires speed in expanding facilities one of the most logical ways to accomplish this is to confine purchases to existing designs. If future orders are placed as duplicates much engineering time could be saved in addition to the use of existing patterns and dies. A new locomotive design requires an average of 30,000 man-hours even for an experienced builder and when the time of the railroad mechanical department is added to this it can be seen that a large saving in time as well as money can be made by using existing design." Mr. Johnson also joined with other speakers in suggesting substitutions for increasingly scarce materials and added further the idea of eliminating the use of devices on locomotives which have not proved their ability to influence performance favorably and to add such devices as are known to increase locomotive efficiency.

In the field of locomotive design and utilization, K. Cartwright, mechanical engineer, New York, New Haven & Hartford, suggested the value of recounterbalancing many of the older locomotives in accordance with recently recommended practices. "Many locomotives," said Mr. Cartwright, "that under normal conditions would be considered obsolete are being put back into service to meet emergency demands. The use of these locomotives in main-line service in many cases obstruct the flow of traffic because they cannot be operated at today's speeds without causing damage to track. By taking advantage of the information now available these locomotives can be rebalanced at small cost so that they can take their place in modern main-line operation." R. M. Ostermann, Superheater Company, said that the wish for a more complete standardization of steam locomotives could only be fulfilled through departure from the present conventional design; by building a steam locomotive with considerably altered horsepower-speed characteristics. Mr. Ostermann visioned such a locomotive as one with mechanical drafting as well as firing; one in which the prime mover would be geared to the drivers and one in which a large enough percentage of total weight is carried on the drivers to permit the development of maximum tractive force without slipping.

John M. Hall, director, Bureau of Locomotive Inspection, Interstate Commerce Commission, emphasized the value of maintaining the standards of safety and pointed out that a high standard of locomotive condition has been responsible for the ability of the railroads to do the job that has already been done. Referring specifically to the practice on some roads of patching up, Mr. Hall cited an experience during the last war wherein

(Continued on page 19)

* A list of the proposed designs is set forth in an article on page 512 of the December, 1941, issue of the *Railway Mechanical Engineer*.

Measurement of

Stresses in Car Wheels

Part II†

By Reid L. Kenyon and Harry Tobin*

Technique of the Rosette Method

THE practical application of the rosette method to the study of stresses will always involve problems peculiar to the particular type of structure under consideration. This is especially true in the case of railway car wheels due to their complicated section.

The theoretical limitations of the method are as follows:

(a) All deformation must be elastic;

(b) The results are strictly correct only on plane surfaces because the theory is based on the condition of "plane stress." However, close approximations can be made on surfaces of very slight curvature if the gage length is short.

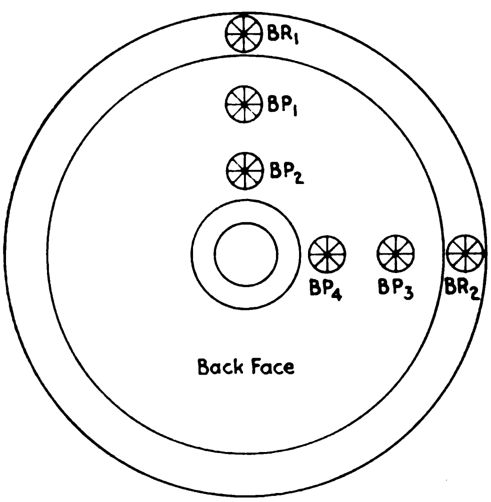


Fig. 8

There are two kinds of stresses of interest in wheels: those present as the result of the treatment of the wheel previous to examination, and those that may result from subsequent treatments. In both cases rosettes are placed at the locations where the condition of stress is to be studied and a complete set of measurements of all gage lines is taken. In the first case the rosettes must then be cut out to relieve them from the restraining effect of the surrounding metal and a second set of readings taken after the initial stress condition has been relieved by the cutting. This is a destructive test. In the second case, however, the wheel is subjected to the desired conditions of test or service and after or during this subsequent treatment, further readings of the gage lines are taken and thus the "change in stress" resulting from the subsequent treatment is determined.

In selecting locations for the rosettes on the wheels the greatest interest will usually be at the points of highest stress. Due to the design of the wheels this is in the plate or web section. There is no limit to the number of rosettes that can be placed on the wheel but actually it is necessary to use only a very few to study the critical stresses. Rosettes BP_1 and BP_2 located on the back face of a wheel as shown in Fig. 8 and corresponding rosettes FP_1 and FP_2 (not shown) directly opposite them on the front face will determine the highest stresses usually found in the plate of a wheel. This statement is based on extensive explorations made, during the past five years, of stresses at various locations in wheels. These rosettes are located as near as possible to the hub and rim fillets without departing from the essentially flat portion of the plate of the wheel. Radial measurements across the fillets should be avoided due to the errors which they introduce.

When the faces of the rim are wide enough a rosette BR_1 is placed on the face of the back rim in a radial line with plate rosettes as shown in Fig. 8. A corresponding rosette is placed at FR_1 directly opposite on the front face.

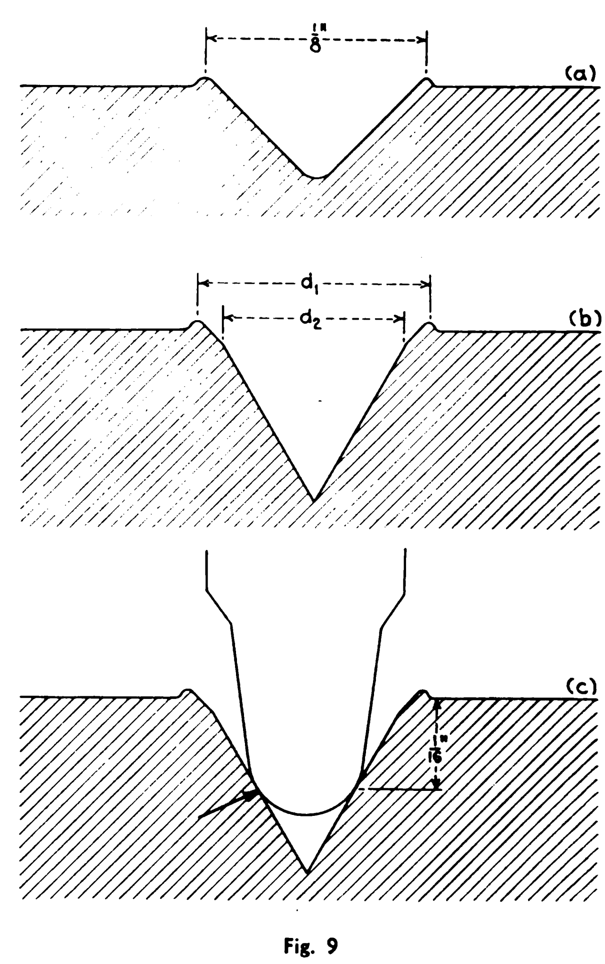


Fig. 9

* Associate director and research engineer, respectively, Research Laboratories, The American Rolling Mill Company, Middletown, Ohio.
† Part I of this study appeared in the December, 1941, issue.

A duplicate set of rosettes BR_2, BP_3 and BP_4 is generally located 90 deg. from the first set as shown in Fig. 8 and of course corresponding rosettes FR_2, FP_3 and FP_4 are placed opposite these on the front face. Additional sets of rosettes can be added and they are frequently placed in four positions 90 deg. apart. Unless variation in the magnitude of the stresses at different points around the wheel is suspected it is rarely necessary to use more than two sets.

The rosettes can, of course, be applied to any essentially flat surface of the wheel. For example, in some studies, we have placed rosettes on the tread and determined the initial stresses by making measurements before and after cutting out the rosettes.

When wheels have a thin layer of martensite on the tread due to brake action a small hand grinder has been used to grind "spots" through the hard skin so that punch marks could be made in the underlying metal in the regular manner. Some error is probably introduced depending on how deep the gage marks are located under the "extreme fiber."

The method of making the gage marks for the rosettes has an important effect on the accuracy of the results, and depends on the type of strain gage used. Although, as

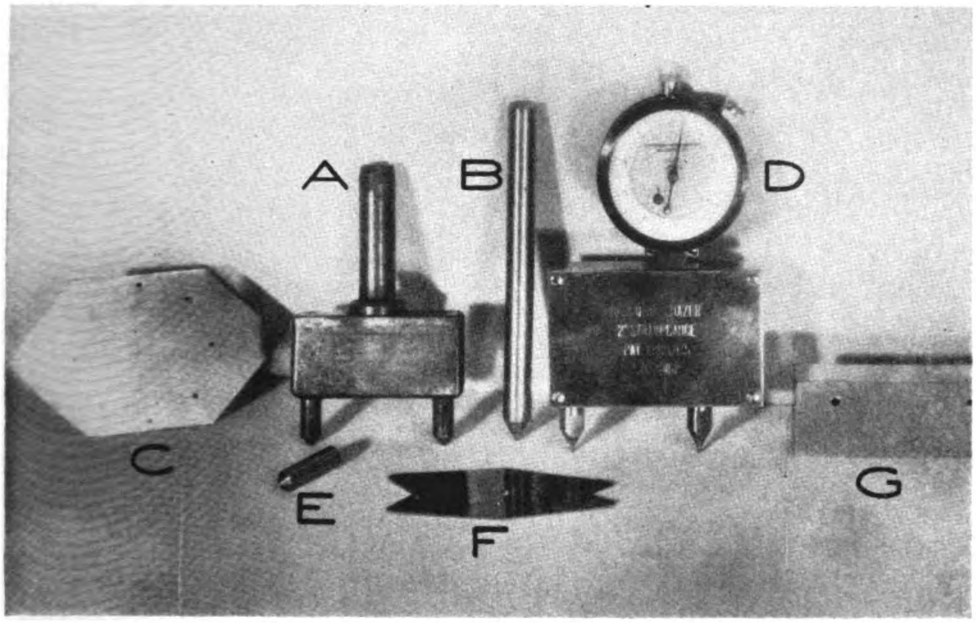


Fig. 10—Special tools required for making punch marks on wheels and for measuring rosettes

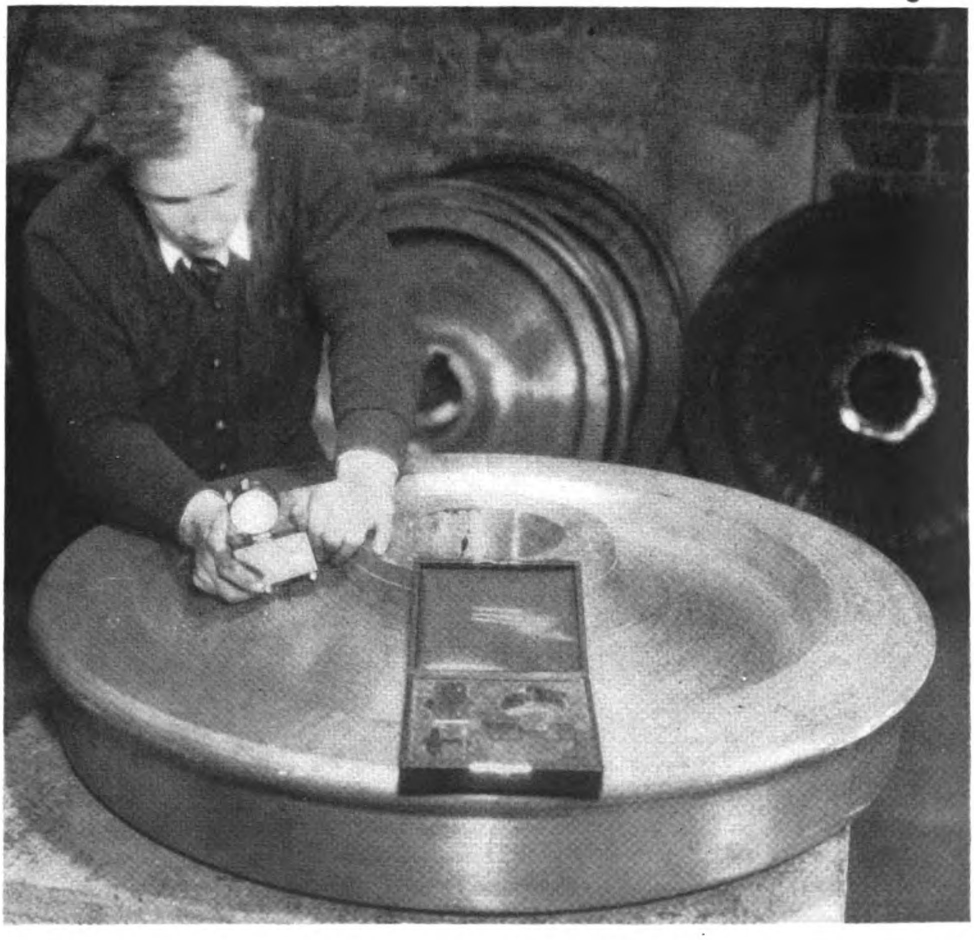


Fig. 11—Method of using strain gage in measuring a rosette on a car wheel

Fig. 12—Measuring the temperature of the wheel near the rosettes

far as the application of the rosette theory is concerned, any accurate strain gage can be used, in most wheel studies we are forced to use a removable or "hand-held" gage. This makes it necessary to establish fixed reference points which can be maintained undamaged during the course of a test or during subsequent treatments.

We have found it advantageous to use a gage in which the movable point moves so as always to be parallel to the fixed point. This avoids any variation in angularity of the points as they enter the gage holes. There are a number of gages which meet this condition: we have found the Olsen-DeShazer gage to be quite satisfactory in our work. This gage has points shaped as shown in Fig. 9 (c).

There are two types of holes that have been used in connection with "hand-held" strain gages—drilled holes and punched holes. Drilling is an expensive and time-consuming procedure especially in hard high carbon steel, since the drills used must be quite small. In spite of these difficulties some workers prefer this method and get satisfactory results. On the other hand, properly designed punches will rapidly produce accurately spaced holes of uniform and proper contour which, due to the cold working effect are actually smoother than drilled holes.

The technique of making satisfactory punched holes is not difficult but there are several important steps which will now be described in some detail. The tools used, with the exception of a good hammer, are shown in Fig. 10. A template (c) is convenient for locating the gage marks. This is held in the proper position on the wheel by one operator while a second man lightly punches through the holes in the template with the two pointed punch (a) making shallow punch marks in the wheel. If this is done lightly the points of the punch will remain sharp a longer time, especially on hard wheels. The second step is to deepen the shallow holes by restriking with the two pointed punch. Two or three blows may be necessary to produce a good hole about 1/8 in. in diameter as shown in Fig. 9 (a). In restriking, care should be taken to seat the punch well in the holes and hold it normal to the surface so that the holes will be deepened without producing ridges along the sides.

The points on the two pointed punch have an included angle of 90 deg. but in hard steel they soon become rounded so that the bottom of the holes become flat as shown in Fig. 9 (a). This would allow the points of the strain gage to touch on the bottom of the holes and give an indefinite reading.

A second punch, Fig. 10 (b), having a 60-deg. included angle is next used to "punch out" the bottoms of the holes made by the first punch. This is a single pointed punch and must be held normal to the surface and struck truly and straight to deepen the hole as shown in Fig. 9 (b). The diameter of this secondary punched hole, d_2, should be at least half of the diameter of the original hole, d_1. When this is properly done the point of the DeShazer gage will touch the sides of the secondary hole about halfway down as shown by the arrows in Fig. 9 (c).

The result of this procedure is to give a "ball and socket" effect to the gage points in the holes so that a slight variation in the angle between the plane of the gage and the plane of the rosette does not produce a noticeable variation in the gage reading.

The use of any "hand-held" strain gage involves considerable practice and the operator must acquire a sense of touch which enables him always to apply the same pressure in holding the gage. After repeatedly remeasuring a number of gage lines until consistent results are obtained, the operator can proceed with some confidence in the measurement of test rosettes.

An experienced operator will find that certain precautions aid materially in obtaining reliable readings and

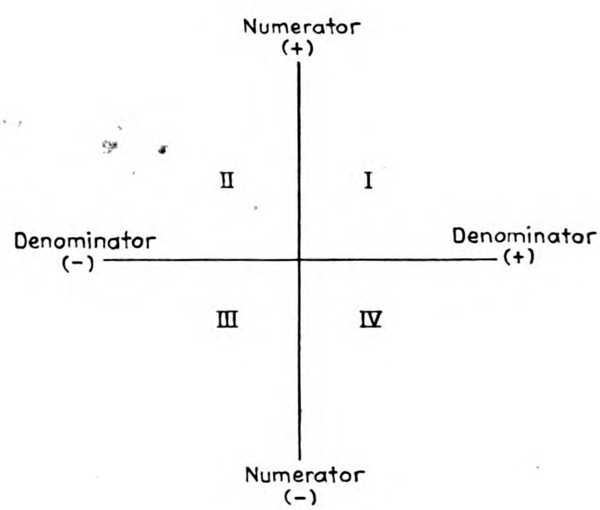


Fig. 7

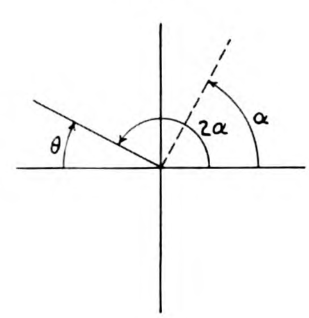


Fig. 13

the novice will do well to follow these from the start. In the first place the gage should never be turned end for end in measuring a gage line; the same point of the gage should always be placed in the same hole when making repeated measurements such as the initial and final readings. In the second place the gage should always be held in exactly the same manner, some prefer to place the forefingers on top of the gage but we get better results by applying the pressure with the thumbs as shown in Fig. 11.

One gage point is placed in one of the holes and the gage moved so that the other point is forcibly made to enter the other hole. The spring in the gage which pulls back on the movable point should be strong enough to

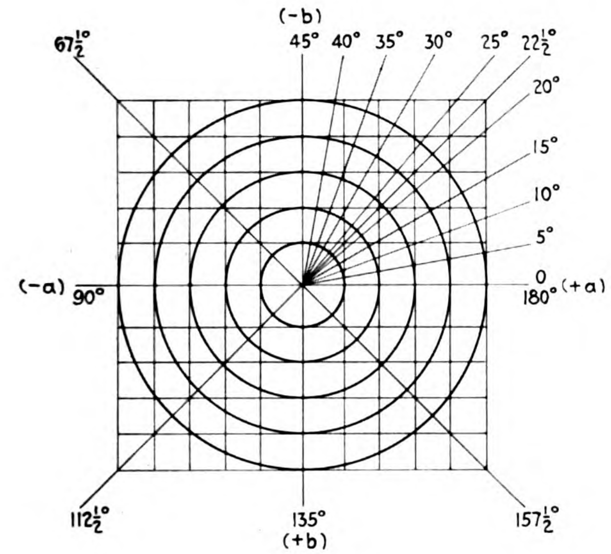


Fig. 14

furnish considerable opposition to this so the operator will have to apply force to "snap" it into the hole.

This will seat it well and lead to more consistent readings. The first gage point is kept in its hole and this action repeated several times in seating the second point. Concurrently the gage is moved forward and backward 5 to 10 deg. from the vertical and when the same reading can be repeated several times this is taken as the value for this gage line. Any difficulty in repeating may be due to an improperly shaped hole and if this is discovered while the initial readings are being taken the hole can be repunched. It will generally be found necessary only to use the second 60 deg. punch for this.

Although either the stationary or the movable point of the gage can be entered into the first hole a uniform practice must be adopted and all readings taken the same way. If the stationary point is entered first, the movable point is adjusted with the fingers.

In order to eliminate the effect of temperature on the gage readings, the wheels must be at a uniform temperature throughout and the final measurements should be made with the wheel or the rosettes at the same temperature as when the initial readings were taken. This is necessary because tests have shown that a temperature coefficient of expansion cannot be used to correct for temperature differences.

The temperature of the wheel is measured as shown in Fig. 12. A small ring of plasticine is pressed onto a horizontal surface and nearly filled with mercury. This soon assumes the temperature of the wheel by conduction and its temperature can then be measured with an ordinary thermometer. Subsequent measurements of the wheel or the rosettes after removal from the wheel must then be made at as nearly this initial temperature as possible.

After the initial measurements are made the rosettes will either be cut out and remeasured or else the wheel will be subjected to certain conditions of test or service and the rosettes again measured without being cut out. In either case it is essential that the gage holes be protected from damage. Not only must mechanical injury be prevented but the holes must be free from rust, grease or dirt when measured and the easiest way to accomplish this is to cover them with some protective layer.

When the wheel will not be heated much above room temperature or subject to other severe conditions we have found it sufficient to cover each hole with a ⅜-in. square of scotch masking tape and then coat over the entire area of the rosette with a generous application of rubber cement.

When gage marks are placed on wheels in regular railroad service some protection is needed which will

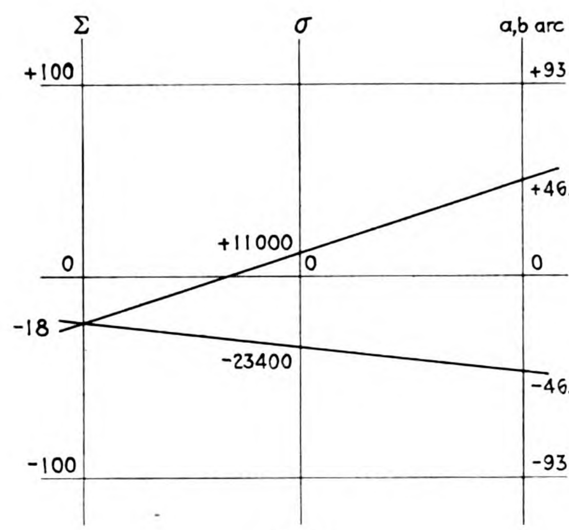


Fig. 15

withstand considerable heating from brake action and will withstand atmospheric conditions. Ordinary shellac has been fairly satisfactory when applied heavily directly to the holes. The only difficulty with this is its removal when the holes are to be remeasured. Weathering makes the shellac brittle and it can be removed by carefully scraping holes with small reamers made from broken machine taps followed by wiping with a close-woven

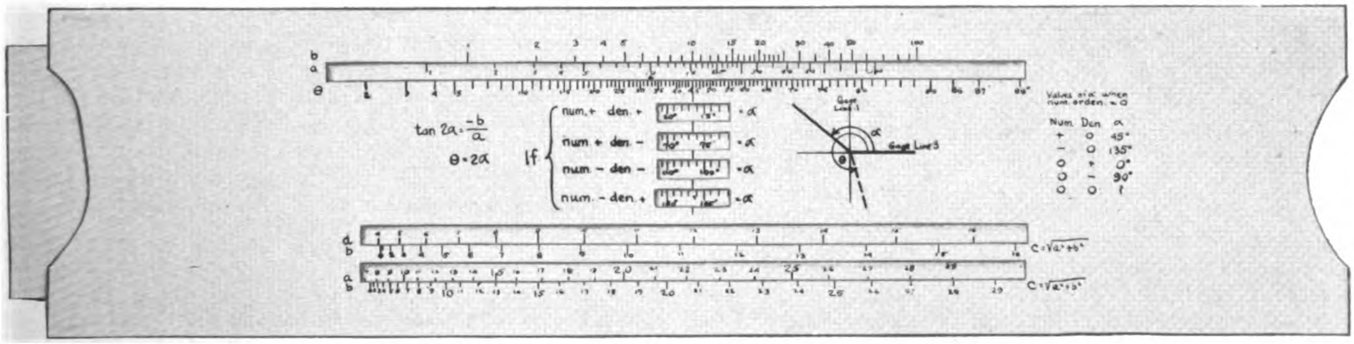


Fig. 16—Front of cardboard type slide rule for calculating rosettes

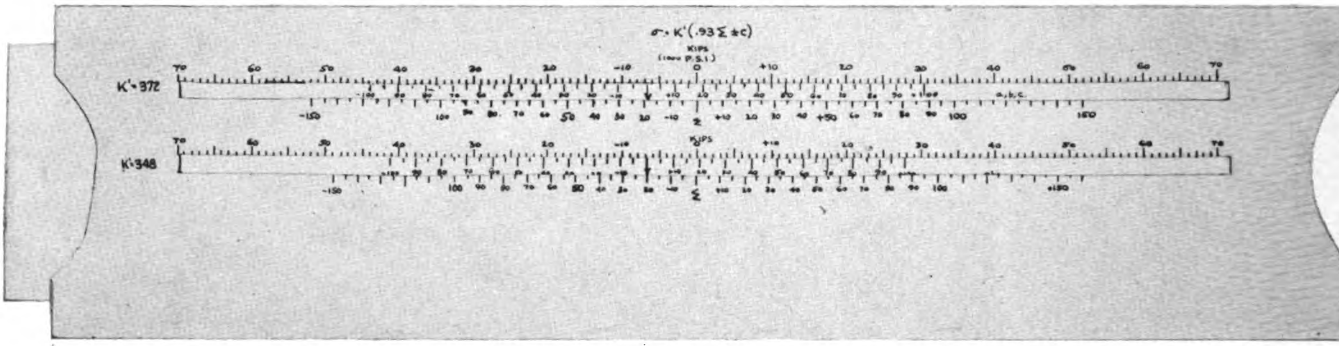


Fig. 17—Back of a cardboard type slide rule for calculating rosettes

thin cloth. A gasket sealing material called Permatex No. 1 has been tried recently and indications are that it will withstand atmospheric conditions and the heat effects of the brake action in service.

When the initial stresses are to be determined it is necessary to cut the rosettes from the wheel. The manner of cutting is unimportant provided it does not, in itself, produce any deformation of the rosette, or damage the gage holes. In the case of the plate, the rosettes are immediately opposite on the two faces and when a 3-in. by 3-in. section containing them is removed by sawing, for example, the rosettes are, for all practical purposes, completely relieved from the restraining forces originally imposed by the surrounding metal. Experiments have shown that no further relief is afforded by removing more metal from around the rosette, as by turning the blocks down to 2¼-in. diameter discs leaving only ⅛-in. outside the gage marks. By making the cuts ¼-in. to ½-in. from the gage marks the rosettes on the two faces do not have to be located precisely opposite and this leeway makes for a more practical working condition.

In the case of the rosettes on the tread, the underlying metal was carefully machined away leaving a circumferential layer about 3⁄16-in. thick. This resulted in the determination of the stresses in the heat affected surface layer.

When the gage lines are remeasured it is possible to check the corrections of the readings by virtue of a peculiar relationship in the rosette. It was shown in equation (28) that the sum of the strains in any two mutually perpendicular directions must always equal the sum of the strains on any other two mutually perpendicular lines. If the differences between the initial and final readings for each gage line are jotted down as measured this check can be quickly applied and if the rosette does not "balance" it will generally be found that one or more holes are damaged or dirty. The sample computation in Table I illustrates the procedure.

Table I

Gage line No.	Dial Divisions				
		Final Gage Readings			
	Initial	1st trial	Diff.	2nd trial	Diff.
1	980	988	+8	988	+8
2	1173	1176	+3	1176	+3
3	1040	1031	−9	1031	−9
4	867	878	+11	863	−4
$d_1 + d_3 = d_2 + d_4$ If rosette balances		$d_1 + d_3 = +8-9 = -1$; $d_2 + d_4 = +3+11 = +14$; Rosette does not balance		$d_1 + d_3 = +8-9 = -1$; $d_2 + d_4 = +3-4 = -1$; Rosette balances	

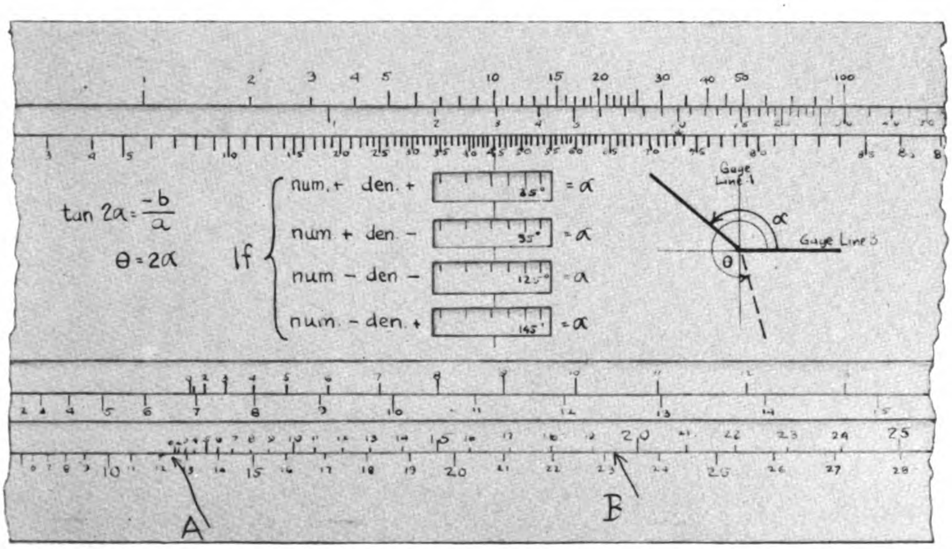


Fig. 18—Enlarged view of scales on slide rule showing setting for computing

$$c = \sqrt{a^2 + b^2}$$

Calculation of Stresses from Strain Readings on the Rosette

In all cases there is an initial and a final set of gage readings on each rosette. The strain, along each gage line may be expressed, in dial divisions, by the difference between the initial and final reading but whether it represents a tension or a compression strain depends on whether or not the rosette was cut out before the final reading was made.

For example, if a certain gage line shortened, this would indicate an initial tension stress if the rosette had been relieved by cutting whereas it would indicate a compression stress if due to subsequent treatment between the initial and final measurements. The following simple rules will serve as a guide in determining the

sign of the strains and this can best be recorded at the time the differences are computed when the final readings are recorded.

1. When the wheel is intact and the rosette is not cut out.

The decrease of a gage length is due to compression and the difference should be marked (—).

The increase of a gage length is due to tension and the difference should be marked (+).

2. When the rosette is cut out.

The decrease of a gage length is due to the relief of tension and the difference should be marked (+).

The increase of a gage length is due to the relief of compression and the difference should be marked (—).

Note: The illustrative set of readings in Table I were for a rosette which was not cut out.

A typical set of data will be used for a rosette which was cut out before the final readings were made. Rule 2. therefore applies in determining the sign of the strains. The computations can be carried out in a straight-forward manner by direct substitution in equations (65) to (71) inclusive.

Gage line No.	Dial Reading in Divisions		
	Initial	Final	Diff.
1	851	836	+15
2	960	952	+8
3	1050	1074	-24
4	985	1002	-17

The constant for the gage used in making the above measurements is given by the following equation.

$$e = Kd = 0.0000334d$$

where e is strain in inches per inch and d is a dial division on the strain gage. As already mentioned this constant K can be incorporated advantageously in equations (65) to (71).

$$11.15 \times 10^6 K = 11.15 \times 10^6 \times 0.0000334 = 372$$

For convenience this may be designated as K'.

Since there are several terms which are used in various combinations in equations (65) to (71) it will be convenient to calculate them first.

$$\begin{aligned} \Sigma &= d_1+d_2+d_3+d_4 && = 15 + 8 - 24 - 17 && = -18 \\ a &= d_3 - d_1 && = -24 - (+15) && = -39 \\ b &= d_4 - d_2 && = -17 - (+8) && = -25 \\ c &= \sqrt{a^2 + b^2} && = \sqrt{1521 + 625} && = \pm 46.3 \end{aligned}$$

Equations (65) to (71) now become

$$\sigma_{max} = 372\ [0.93\Sigma + c] = 372\ [0.93 \times (-18) + 46.3] = +\ 11{,}000 \text{ lb. per. sq. in.}$$

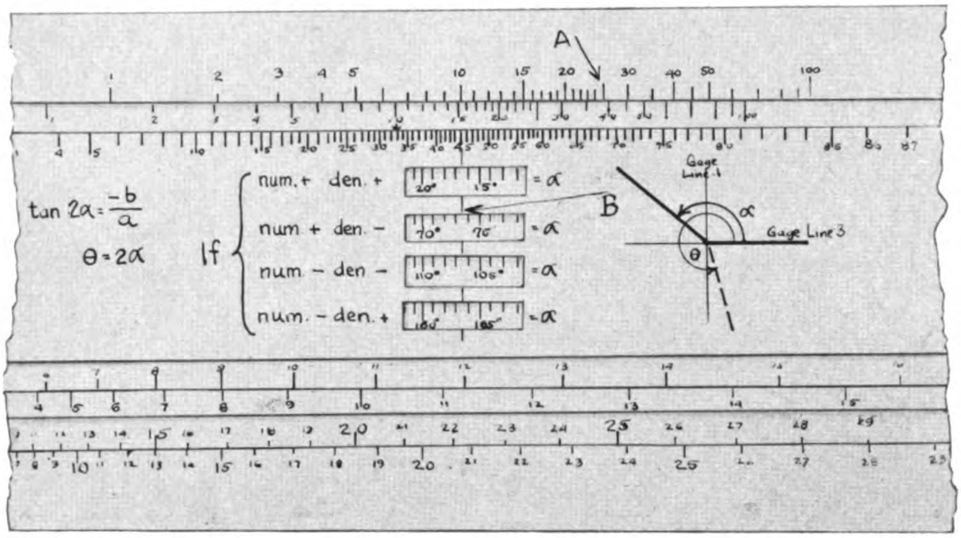


Fig. 19—Enlarged view of scales on slide rule showing setting for computing the angle α

$$\sigma_{min} = 372\ [0.93\Sigma - c] = 372\ [0.93 \times (-18) - 46.3] = -\ 23{,}400 \text{ lb. per sq. in.}$$

$$\sigma_1 = 372\ [0.93\Sigma - a] = 372\ [0.93 \times (-18) - (-39)] = +\ 8{,}300 \text{ lb. per sq. in.}$$

$$\sigma_2 = 372\ [0.93\Sigma - b] = 372\ [0.93 \times (-18) - (-25)] = +\ 3{,}100 \text{ lb. per sq. in.}$$

$$\sigma_3 = 372\ [0.93\Sigma + a] = 372\ [0.93 \times (-18) + (-39)] = -\ 20{,}700 \text{ lb. per. sq. in.}$$

$$\sigma_4 = 372\ [0.93\Sigma + b] = 372\ [0.93 \times (-18) + (-25)] = -\ 15{,}500 \text{ lb. per. sq. in.}$$

$$\sigma_\alpha = 372\ [0.93\Sigma + (-39 \cos 2\alpha) - (-25 \sin 2\alpha)\ ]$$

Any angle α can be substituted in this equation.

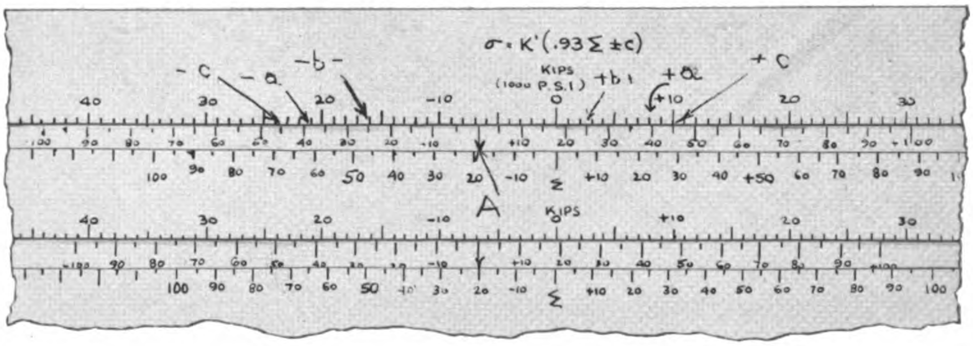


Fig. 20—Enlarged view of scales on slide rule showing setting for computing the maximum and minimum stresses and the stresses in the directions of the four gage lines

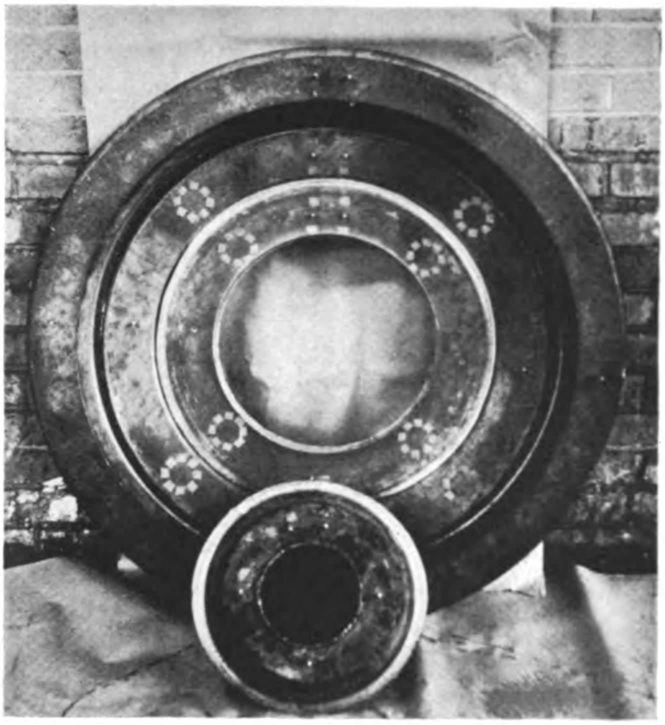


Fig. 21—Rings cut from a railroad car wheel to compare the rosette method with other methods for determining internal stresses

If α = 117 deg. then 2α = 234 deg. which can be stated as 180 deg. + 54 deg.

Sin (180 deg. + 54 deg.) = −sin 54 deg. = −0.809

Cos (180 deg. + 54 deg.) = −cos 54 deg. = −0.588

$\sigma_{117\ \text{deg.}} = 372\ [\ 0.93\ (-18) + (-39)\ (-0.588) - (-25)\ (-0.809)\ ] = -5{,}200$ lb. per sq. in.

Since the maximum and minimum stresses are of opposite sign, $\sigma\gamma = \frac{1}{2}\ (\sigma_{\max} - \sigma_{\min}) = \frac{1}{2}\ [\ +11{,}000 - (-23{,}400)\ ] = 17{,}200$ lb. per sq. in.

It will be noted that all of the above stresses are given to the nearest 100 lb. per sq. in. This is one decimal place farther than their accuracy because of the limitations of the strain gage used in this case.

$$\text{Tan } 2\alpha = \frac{-\text{b}}{\text{a}} = \frac{-(-25)}{-39} = \frac{+25}{-39} = -0.641$$

It is seen from Fig. 7 which is repeated here, that 2α falls in the second quadrant. This must be determined by inspection of the signs of the numerator and the denominator because the usual trigonometric tables do not supply this information.

The angle obtained from the table of natural tangents for 0.641 is 32 deg. 40 min. This will be designated as θ and from trigonometry.

$$-\tan\theta = \tan\ (180° - \theta)$$

Since in the above equation

$$\tan 2\alpha = -0.641$$

$\tan^{-1}(-0.641)$ = (180 deg. − 32 deg. 40 min.) = 147 deg. 20 min.

Then 2α = 147 deg. 20 min.

and α = 73 deg. 40 min.

The following rules will be helpful in determining 2α for any case that may arise.

Let θ = the angle taken from the table of tangents.

The relationship between the angles α, 2α and θ is shown in Fig. 13.

Then after the quadrant in which 2α falls is determined from Fig. 7 the value of 2α can be found from the following rules.

Quadrant found from Fig. 7	Value of 2α
I	θ
II	180 deg. − θ
III	180 deg. + θ
IV	360 deg. − θ

When a large number of computations are to be made the work is simplified if the steps are tabulated as completed. The sample form shown as Table II will be found convenient.

The use of such a tabular form greatly speeds up the work of computation and for many users will answer the purpose. Certain further aids to calculation have been developed, however. The radical $\sqrt{a^2 + b^2}$ and the angle of the maximum stress $\alpha = \frac{1}{2}\tan^{-1}(-b/a)$ can both be solved graphically from a right triangle whose sides are b and a and a polar chart similar to that shown in Fig. 14 has been constructed for these steps.

A series of concentric circles is used to determine the hypotenuse of the triangle which solves the radical. And the angles are evaluated so as to give α directly. The solution of steps (15) to (21) in the tabular form can be stated as a simple arithmetical operation as

$$K'(0.93X + Y)$$

which is equivalent to

$$0.93K'X + K'Y$$

Table II

Line No.	Rosette No.		1	2	3	4
	d_1 d_2		+15 +8	+10 +6	+40 +26	−8 +40
	d_3 d_4		−24 −17	−5 −1	+5 +19	−27 −75
1	$d_1+d_2+d_3+d_4$	Σ	−18			
2	d_3-d_1	a	−39			
3	d_4-d_2	b	−25			
4	$(d_3-d_1)^2$	a^2	1521			
5	$(d_4-d_2)^2$	b^2	625			
6	a^2+b^2	...	2146			
7	$\sqrt{a^2+b^2}$	c	±46.3			
8	0.93Σ	...	−16.7			
9	0.93Σ + c	...	+29.6			
10	0.93Σ − c	...	−63.0			
11	0.93Σ − a	...	−55.7			
12	0.93Σ − b	...	−41.7			
13	0.93Σ + a	...	+22.3			
14	0.93Σ + b	...	+ 8.3			
15	K′(0.93Σ + c)	σ_u	+11000			
16	K′(0.93Σ − c)	σ_v	−23400			
17	K′(0.93Σ − a)	σ_1	+8300			
18	K′(0.93Σ − b)	σ_2	+3100			
19	K′(0.93Σ + a)	σ_3	−20700			
20	K′(0.93Σ + b)	σ_4	−15500			
21	$\frac{1}{2}(\sigma_u - \sigma_v)$	γ	17200			
22	$\frac{1}{2}(\sigma_u)$ or $\frac{1}{2}(\sigma_v)$	$\sigma\gamma$	......			
23	−b/a	...	−0.641			
24	$\tan^{-1}(-b/a)$	θ	32 deg. 40 min.			
25	2α	...	147 deg. 20 min.			
26	α	...	73 deg. 40 min.			

By the use of proper scales in an alignment chart this series of steps can be easily solved. Such a chart is shown schematically in Fig. 15. The case is for the determination of σ_u and σ_v in the previous example.

Rules for constructing such an alignment chart are (1) Three vertical lines are drawn parallel and equidistant. (2) A horizontal zero line is drawn perpendicular to them and bisecting each. (3) Lay off a uniformly divided scale on the left hand scale with 120 divisions above and an equal number below the zero base line. (4) At $\Sigma = \pm 100$ draw horizontal lines parallel to the zero line. (5) The points where these lines intersect the right hand vertical lines have the value of $\pm$ 93 and the distance from 0 to these intersections should be divided into 93 equal parts to establish this scale. Extend to $\pm$ 100 divisions. (6) The scale for σ will depend on the gage constant K'. This is also a uniformly divided scale which can be established by computing from equation (65) the value σ_{max} for given values of Σ and c. A different chart will be required for each value of K or K'.

The compactness of the calculating devices shown in Figs. 14 and 15 can be improved by devising a special slide rule made of cardboard with a front and back slide and a slide working between them. The front of the rule, which is shown in Fig. 16, is about 5-in. wide and 20-in. long.

The two top scales are for setting values of a and b for determining the angle of the maximum stress, α. There are four scales (shown through windows) in the center of the rule and the proper one is chosen according to the signs of the numerator and denominator of the fractions –b/a.

There are two sets of scales at the bottom for calculating the equation $C = \sqrt{a^2 + b^2}$. The upper of these two sets of scales is designed for handling smaller numbers (up to C = 16) while the lower set will take up to C = 29. If larger numbers are involved submultiples can be used such as one half, one third or any other number that divides easily so that the conversion can be made mentally.

The back side of the rule is shown in Fig. 17. Two sets of scales are shown, each for a different value of K'. This side of the rule performs calculations of stress from the preliminary calculations of Σ, a, b and c. A different set of scales is required for each value of K'.

The use of the rule for calculating the stresses in the rosette given by way of example in Table II will now be described. The values of Σ, a and b are computed mentally and entered in the form.

Table III—Stress in the Plate of a Wheel Obtained by The Rosette and Ring Methods, Kips* per sq. in.

Rosette No.	Stress Rad.	Stress Tan.	Stress Max.	Ring Method Tangential
Front Face at Rim (Outer Ring)		....	....	+ 66
Rosette 1	− 8	12	12	
3	− 7	12	− 12	
5	− 6	− 11	− 11	
7	− 7	− 13	13	
Back Face at rim				
Rosette 1	+ 9	− 1	+ 10	
3	+ 10	0	+ 10	
5	+ 9	− 1	+ 9	
7	+ 12	1	12	
Front Face at Hub (Inner Ring)		....	..	− 55
Rosette 2	+ 14	10	+ 14	
4	+ 16	− 11	+ 16	
6	+ 12	− 7	+ 12	
8	+ 9	− 3	10	
Back face at Hub				
Rosette 2	2	− 15	− 15	
4	4	− 13	− 18	
6	9	8	10	
8	− 10	− 10	− 12	

* 1 Kip = 1,000 lb.

Line No.	Rosette No.	1
	d_1 d_2 / d_3 d_4	+15 + 8 / —24 —17
1	Σ	—18
2	$(d_3—d_1) = a$	—39
3	$(d_4—d_2) = b$	—25
4	$\sqrt{a^2+b^2} = c$	±46.3
5	$K'(.93\Sigma + a) = \sigma_3$	—20700
6	$K'(.93\Sigma — a) = \sigma_1$	+8300
7	$K'(.93\Sigma + c) = \sigma_u$	+11000
8	$K'(.93\Sigma — c) = \sigma_v$	—23400
9	$\frac{1}{2}(\sigma_u — \sigma_v) = \sigma_v$ $\frac{1}{2}\sigma_u$ or $\frac{1}{2}\sigma_v = \sigma_v$	17200
	—b/a	
10	$\tan^{-1}(-b/a) = \theta$	
11	2α α from d_3	73°40′

The value for $c = \sqrt{a^2 + b^2}$ is computed with the rule as shown in Fig. 18. Since b is larger than the scales will accommodate half values are used and the answer doubled. At the arrow marked A in Fig. 18 the zero point on the slide is set to 12.5 (one-half of b) and opposite the arrow marked B at 19.5 (one-half of a) on the slide, we read about 23.15 on the lower scale. Doubling this we get ±46.3 for c and enter this in the proper place in the form.

Before turning the rule over for computing the stresses we may now calculate the angle α which the maximum stress makes with gage line 3 (with the tangential direction). This setting of the rule is shown in Fig. 19. At the arrow marked A the value of b = —25 is shown opposite a = —39 on the adjacent scale. The proper one of the four scales for reading the answer α is selected by noting that both a and b are negative and therefore the numerator of the fraction –b/a is positive and denominator is negative. The answer is found on the scale marked accordingly and the arrow marked B indicates the value for α as 73-⅔ deg. or 73 deg. 40 min. This can be entered directly in the tabulation without reference to the intermediate items –b/a, $\tan^{-1}(-b/a) = \theta$, and 2α which are necessary when trigonometric tables are used.

The stress calculations are made on the reverse side of the rule as shown in Fig. 20. The constant for the De Shazer gage used in making these particular readings was such that $K' = 372$ so the upper set of scales is used. The arrow on the slide is set at $\Sigma = —18$ as indicated at the large arrow marked A then opposite values of ± a, ±b, and ± c on the scale on the slide all of the stresses shown in Table II can be read from the top scale of the rule. The actual signs of the numerical values of a and b must be considered. In this case both are negative so that σ_3 which is computed from +a would in this case be read at a = —39 on the rule (arrow marked = a) and σ_1 is read at a = +39 on the rule (arrow marked +a).

The maximum and minimum stresses are found by using ±c as indicated by the arrows marked +c and —c. Ordinarily the stresses at gage lines 2 and 4 are of little interest and are not computed but if desired they are obtained by using +b and —b as described for +a and —a. The shear stress is determined in the same way as before from the maximum and minimum stresses taking proper consideration of their signs.

Conclusion

From the foregoing presentation it will be understood that the rosette method is applicable to a wide variety

of studies on various types of structures. We are concerned here only with its application to wheels but even in this field there is a wide range of effects that can be studied by its use. The authors first used it to study stresses in wheels under static load and later (in 1936) applied it to an investigation of the effect of brake action on plate stresses as determined by extensive tests over a two and a half year period on the A. A. R. brake testing machine at Purdue University, and since then for over three years on a special wheel testing machine at the Butler, Pennsylvania Plant of the American Rolling Mill Company. This was followed with measurements of the changes in stress in wheels in service. In addition to these studies, tests have been made to study the influence of manufacturing variables on stresses in wrought steel railroad wheels. Thus the methods herein described have proved useful in the study of railroad service conditions and the production of wrought steel wheels that would best meet them.

Acknowledgments

The authors are indebted to R. L. Templin, of the Research Laboratory of the Aluminum Company of America, for first calling to their attention the possibility of using the rosette method for determining internal stresses in railroad car wheels. They also appreciate the helpful comments that he and R. G. Sturm, of the same laboratory, have made in reviewing the manuscript for this article.

H. L. Whittmore and W. R. Osgood, of the National Bureau of Standards, also read the manuscripts and offered helpful suggestions.

Robert H. Heyer and Robert P. Hindman, of The American Rolling Mill Company, also rendered valuable assistance, the former in preparing special charts for graphical computation, and the latter in conducting the comparative study of the rosette and ring methods described in the Appendix.

The authors also wish to express their appreciation to Anson Hayes, Director, Research Laboratories of The American Rolling Mill Company, for his constructive suggestions in connection with this study.

Appendix I

COMPARISON OF ROSETTE METHOD WITH RING METHOD OF DETERMINING INTERNAL STRESSES IN A RAILROAD CAR WHEEL*

The ring method for determining internal stresses in a railroad car wheel has been used to some extent. This method, illustrated in Fig. 21 consists of cutting the plate into two rings. The width of one ring extends from the rim fillet to the middle of the plate and the width of the other ring is from the middle of the plate to the hub fillet. Two pins or other reference points are first put at the mid-width of each ring, two inches part in a tangential direction. The distances between these pins are measured with micrometers or some other suitable measuring instrument. The rings are then cut off of the wheel and slotted radially between the pins. The tangential distances between the reference points are measured again. Using the mean circumference of the ring (diminished by the distance between the reference points) as the gage length, the tangential strain in inches per inch is computed. The product of the strain and the modulus of elasticity gives the tangential stress in pounds per square inch.

Table IV—Calibration Chart of Federal Dial

.005 = + .0001	.105 = + .00011
.010 = + .00009	.110 = + .00012
.015 = + .00011	.115 = + .00009
.020 = + .00006	.120 = + .00001
.025 = + .00006	.125 = − .00001
.030 = + .00005	.130 = + .00001
.035 = + .00003	.135 = + .00009
.040 = − .00011	.140 = + .0001
.045 = − .00011	.145 = + .00008
.050 = - .00001	.150 = + .00002
.055 = + .00008	.155 = + .00007
.060 = + .0001	.160 = + .00008
.065 = + .00011	.165 = - .00009
.070 = + .00002	.170 = + .00001
.075 = − .00004	.175 = − .00008
.080 = − .00005	.180 = − .00001
.085 = − .00001	.185 = + .00004
.090 = − .00005	.190 = - .00003
.095 = - .00009	.195 = - .00018
.100 = + .00002	.200 = + .00002

* Taken from Report W-78, May 23, 1938, by R. P. Hindman, Butler Metallurgical Department, American Rolling Mill Company.

In order to check the ring method against the rosette method, a control cooled wheel was used and four rosettes were placed on the front and back face of each ring before the rings were cut out. The rings were cut and measured in the normal manner and the tangential stress calculated. Finally the rosettes were cut out of the rings and their stresses were calculated. A comparison of the results obtained from each method is shown in Table III.

Table V—Calibration Chart of Olsen DeShazer Strain Gauge — 2 in. Gauge Length

Standard Calibrating Apparatus	Instrument Reading Upward	Instrument Reading Downward	Standard Calibrating Apparatus	Instrument Reading Upward	Instrument Reading Downward
.0000″	1000	1000	.0210″	1315.2	686
.0010	1015	985	.0220	1330	670.7
.0020	1030	970	.0230	1345	656
.0030	1045	954.5	.0240	1360	639
.0040	1060	939.8	.0250	1375	624.4
.0050	1075	925	.0260	1395	610
.0060	1090	910	.0270	1405.5	595.5
.0070	1105	895	.0280	1420	580.3
.0080	1120	880	.0290	1435	566
.0090	1135.5	865	.0300	1450.5	549.3
.0100	1150.3	850	.0310	1465	535.3
.0110	1165	835	.0320	1480	520.6
.0120	1180	820	.0330	1495.8	505
.0130	1195	805	.0340	1510.6	490.7
.0140	1210.5	790.5	.0350	1525.5	474.9
.0150	1226	775.6	.0360	1540.8	460.9
.0160	1240	760	.0370	1556.1	445.9
.0170	1256	745	.0380	1572.1	430.1
.0180	1270	730.9	.0390	1587.3	415
.0190	1285	715	.0400	1601.7	399.6
.0200	1300	700.5			

The ring next to the rim showed a tangential stress of +66,000 lb. per sq. in. which is too high for this type of wheel. The rosettes cut from this ring showed that the tangential stress on the front face average —12,000 lb. per sq. in. and on the back face about —1,000 lb. per sq. in. The radial stress is not given by the ring method but the rosettes showed an average of —7,000 lb. per sq. in. on the front face and +10,000 lb. per sq. in. on the back face. These two methods also show large differences in stress on the ring next to the hub. The ring method gives a tangential stress of —55,000 lb. per sq. in., while the rosette method gives an average tangential stress of —8,000 lb. per sq. in. on the front face and —12,000 lb. per sq. in. on the back face. The average radial stresses from the rosettes are +13,000 lb. per sq. in. on the front face and —6,000 lb. per sq. in. on the back face.

In considering the inconsistency between the two methods, it is observed that there is a variation in the stress distribution in the plate from hub to rim as shown by the radial stresses computed from the rosettes. The back face is in radial tension at the rim and compression at the hub and on the front face the opposite occurs. This could result in a bending moment that tends to open up or close up the rings when they are cut radially between the reference marks. It is thought that this accounts for the abnormally large dimension changes across the radial cuts.

(*Continued on page 19*)

George McCormick, D. Eng.

The G. S. M. P. of the Southern Pacific Company who was highly honored by his alma mater

GEORGE McCORMICK, chief of the mechanical department of a great western railway system, the Southern Pacific Company, last June was given the degree of Doctor of Engineering (D. Eng.) by his Alma Mater, the Agricultural and Mechanical College of Texas. By what route did he arrive at so exalted a position? What training, what traits of character, what accomplishments fitted him for so important an assignment on the railway, or inspired Texas Agricultural and Mechanical College to honor him so highly?

A Son of Texas

Before attempting to answer these questions it may be well to review the high spots in Mr. McCormick's career. He is a native of and the greater part of his life was spent in the Lone Star State, Texas, with its great open spaces, its colorful background and history, and its vast natural resources. His father, George McCormick, Sr., served at one time as an attorney general of that state. Born in Columbus, Texas, July 15, 1872, when the Far West was still in a pioneer stage of development, he grew up in an atmosphere which presented a definite challenge to the ambitious young man of that day.

Texas A. & M., when he attended it, was a small institution with only about 200 students. He was graduated with the degree of Bachelor of Mechanical Engineering in 1891 at the age of 19, a clear indication of the burning of much midnight oil. In spite of that, however, he could not be classed as a "dig." The college then, as now, was very much of a military school. Mr. McCormick was a cadet captain in his senior year and was one of three graduates recommended to the United States Government for an Army Commission. One of his prized possessions is a medal won at college as the best drilled man of the crack Company of Ross Volunteers. This military training during his college years did much to shape his early career.

Three railroad mechanical department officers were given honorary doctors' degrees by colleges and universities last June. This is a most unusual occurrence; in fact, is quite extraordinary. Why were these three men, independently and in quite different parts of the nation, so highly honored by three different educational institutions? This is the first one of three articles to answer this question. A similar story on Frederick W. Hankins, assistant vice-president of the Pennsylvania Railroad, will appear in our February issue: and one on K. F. Nystrom, mechanical assistant to the chief operating officer of the Chicago, Milwaukee, St. Paul & Pacific, will be featured in our March issue.

Starts as Shop Apprentice

After graduation he became a machinist apprentice in the shops of the Galveston, Harrisburg & San Antonio (now Southern Pacific) at Houston, Texas, and in the latter part of 1893 was made a draftsman in the office of the superintendent motive power at that place. A few months later, early in 1894, he was transferred to San Antonio, Texas, on a special assignment to supervise the redesigning of a number of locomotives. While at San Antonio he joined the Belknap Rifles, a crack State Militia Company, later serving as its captain. He was recalled to Houston in 1895 and was appointed chief draftsman. Military drill seems to have lost none of its fascination for him and he soon joined the historic and famous Houston Light Guard, which had been organized in 1873.

Captain in Spanish-American War

When the Spanish-American War broke out in 1898 the Adjutant General of the state was commissioned to raise a Texas regiment. It was composed of the twelve best military companies of the state and the Houston Light Guard was designated Company A, First Texas Volunteer Infantry. Mr. McCormick was elected captain and the company was mustered into service at Austin, Texas, May 10, 1898. It was encamped successively at Mobile, Miami and Jacksonville, and was about to embark for Cuba at Savannah, Ga., when the war ended. Captain McCormick's company passed through the typhoid epidemic at Mobile without the loss of a man.

Promptly at the close of the war Captain McCormick resigned to return to railroad work, although his company did go on to Cuba as part of the Army of Occupation. It returned after a few months and was mustered out April 18, 1899. It continued, however, as the Houston Light Guard and Mr. McCormick was again elected its captain, serving in that capacity for some time. The Light Guard, under his leadership, gave an excellent account of itself at the time of the tidal wave, which brought death and destruction to Galveston in 1900; it was an important factor in the preservation of order and in assisting in the rehabilitation of the city.

Mr. McCormick had resumed his position as chief draftsman of the Gulf, Harrisburg & San Antonio when he returned to railroad service, but shortly thereafter, in 1900, was appointed mechanical engineer, in which capacity he remained until December, 1911, when he was made assistant superintendent of the El Paso Division, with headquarters at El Paso. This was in the period when the "unit system of organization" was being applied on the Harriman Lines, under the direction of Julius Krutt-

George McCormick

schnitt. Mr. McCormick was primarily concerned with mechanical department affairs on the division, but was also, under certain conditions at least, charged with much broader responsibilities than when operating under a more highly specialized title.*

In February, 1913, he was made assistant general manager (mechanical) for all of the Southern Pacific Texas Lines, with headquarters at Houston, Texas. In December, 1916, he was appointed general superintendent motive power of the Southern Pacific Company, Pacific System, with headquarters at San Francisco, Cal.

Effect of Military Training

There are a few places in this rather sketchy outline of Mr. McCormick's career that require amplifying. While, judging from his college experiences, he was endowed by nature for military leadership, his training and experience in that field doubtless did much to improve his administrative ability. One of his associates, in fact, suggests that "probably Mr. McCormick's early military training is largely responsible for his ability in properly receiving and giving orders and his ability to handle a great deal of work, always keeping his own desk cleared, and reserving to himself ample time for reflection and thought on various problems at hand of the day and of the future. He is always calm and composed even during trying times and he always seems to feel, no matter how difficult the problem at hand, it can be satisfactorily solved, and after a brief discussion he has the ability to pick out the proper party to assign the task for final disposition and report."

It is noteworthy, also, that his military preferment was not due to the appointive power of higher ups, but rather, after his college experience, to election by his associates. It was thus an expression of the general recognition of his leadership qualities, as compared to selection on a more limited or autocratic basis. As a matter of fact, quiet spoken and thoughtful, he is the antithesis of the "top sergeant" type of drill master so frequently pictured in military service.

The extended period over which he headed up the department of mechanical engineering and design at Houston gave him an unusual opportunity to become a factor in community life; at least, as compared to many mechanical officers who, of necessity, are more frequently moved from place to place.

A "Modern Pioneer"

His long experience in the field of design doubtless accounts, in part at least, for his numerous inventions—so numerous and so important that he was honored as one of the "Modern Pioneers" by the National Association of Manufacturers in 1940. Among his inventions are a system of oil lubrication for driving boxes and other locomotive bearings, retaining clips to prevent loose tires from slipping off wheel centers, locomotive boiler drop plug and multiple system of its application, truck pedestal safety tie bar, and improved lubrication of locomotive connecting rod and crank pin bearings.

Under Mr. McCormick's leadership of a quarter of a century as head of the mechanical department of the Southern Pacific, extensive improvements have been made in shop facilities, passenger and freight cars and motive power, both as to capacity and efficiency. This is particularly notable in the field of motive power. In 1916 the heaviest passenger locomotive was of the 4-6-2 type; a boiler pressure of 200 lb. was used, developing a tractive effort of 29,900 lb., with a boiler efficiency of about 67½ per cent. In 1941 the 4-8-4 type was placed in service, with a boiler pressure of 300 lb., developing a maximum tractive effort of 79,670 lb., and with an overall boiler efficiency of 90 per cent. These new locomotives handle 1,000-ton passenger trains on a one per cent grade at speeds of 53 miles an hour. The increase in capacity, measured by gross ton-miles per train-hour is about 200 per cent.

In 1916 the 2-8-8-2 Mallet was used in freight service and had a boiler pressure of 200 lb.; it developed a tractive effort of 94,880 lb., with a boiler efficiency of about 78 per cent. In 1940 the present 4-8-8-2 type articulated locomotives were placed in service, using 250 lb. boiler pressure and developing a tractive force of 124,300 lb., with an over-all boiler efficiency of 92 per cent. The increase in the capacity of these locomotives, measured in gross ton-miles produced per train-hour, is about 125 per cent.

It is significant that notwithstanding the great increase in the size of locomotives, the average cost of repairs per train-mile run has remained about the same in freight service, and in passenger service has actually been reduced. The average cost of fuel per thousand gross ton-miles in freight service has also been reduced about 44½ per cent, notwithstanding the higher speeds which are now maintained.

It is not to be wondered at that Mr. McCormick was elected a member of the General Committee of the Mechanical Division, Association of American Railroads, in 1939, or that he has served on such committees of that division as locomotive design and construction; design and construction of tank cars; design, maintenance and operation of electric rolling stock; and automatic train control signals.

Leadership Qualities

This story is based largely on expressions from intimate associates of Mr. McCormick who have known him for a long time; each one was asked to express what he thought to be his outstanding characteristics or accomplishments. It is generally recognized that an important attribute of a leader is the ability to teach others. It is significant that early in his career, when he was stationed in San Antonio in 1892, he served as an instructor in the apprentice school. A mechanical department officer, now holding a high position, was one of the apprentices at that time and states that even then he "became impressed with his just and considerate administration of whatever duties might be committed to his care."

When he assumed the leadership of the mechanical department of the Southern Pacific he "came to us practically a stranger," says one of his associates, and "with the exception of Mrs. McCormick, he came alone." Apparently he was not long in adjusting himself to the new surroundings and "his honesty and fairness made us admire and respect him, not only as a man, but as a very outstanding leader."

Another of his associates points out that his "most important personal characteristic is the ability to understand human nature and secure co-operative results from assistants and subordinates." In this connection reference is made to "his kindly but firm disposition," and again, "he mixes his work, even his most important work, with good humor and good cheer."

All of his associates recognize his mechanical ability and initiative and his thorough knowledge of mechanical department problems. We hear him characterized as one who "wisely and swiftly makes plans and courageously executes them, because he is a master of his work." Another expresses it in this way, "Genuine knowledge

* See paper by Major Charles Hine on "The Unit System of Organization" in the Western Railway Club Proceedings for January 21, 1910; American Engineer and Railroad Journal, March 1910, page 106; and Railway Age Gazette, January 18, 1910, page 134.

has always been one of the cornerstones of his real leadership."

That it has been his practice to know what is going on out on the line and in the shops is indicated by the following story.

"In Conference"

One day, while a Southern Pacific train was standing at a station, a passenger, pacing up and down the platform for exercise, observed some distance away two men seated on a pile of crossties. One of them, apparently a laborer, dressed in dirty overalls, his face smudged and soiled, was talking with much emphasis and many gesticulations of his grimy hands.

The other man, in the garb of an office worker, sat quietly by, listening with thoughtful concentration to what the speaker was saying; from time to time nodding in silent agreement, now interjecting a short comment, and again shaking his head in negation, but all the while keeping his keen eyes intently fastened on the speaker.

"Who is that man?" asked the passenger of the conductor.

"I don't know. Some foreman or car whacker, I guess," was the reply.

"No, no; I mean the other man."

"Oh, that's George McCormick, the general superintendent of motive power," said the conductor. "He's probably 'in conference,' " he added, with a chuckle.

Capt. George McCormick
(Jacksonville, Fla., September, 1898)

And very likely he was right. It is said that George McCormick has held a great many more informal conferences out on the line with the men who do the work than he ever thought of holding in the seclusion of his office.

Mr. McCormick has a keen sense of good organization procedure and the importance of preserving lines of authority. It is said that when making inspection trips through the shops he sometimes finds a workman doing the job in the wrong way. He may ask questions, but will never criticize the man. He knows that the supervision is responsible and that the proper procedure is to take the matter up with the worker's superiors to insure that he is properly supervised in the future.

He is said to possess the happy trait of standing a hundred per cent back of his men if he thinks they are trying to do the right thing, even though they may make mistakes, but he has no use for anyone who tries to shirk responsibility.

Can Be Tough on Occasion

His good nature does not encourage carelessness or laxity on the part of those with whom he deals, because it is balanced by determination and firmness. One of his associates emphasized these traits in the following way: "We like him because he's a gentleman and gives everybody else credit for being one. He can be plenty tough if he thinks the occasion calls for it—but he always makes his peace before the day is over. He may do this indirectly and without reference to the 'call-down,' but he lets you know very clearly that it is all well again between you and the old man, and you don't have to go home to worry about the job."

Exemplifies the Golden Rule

"His great rule of action," comments another associate, "is the Golden Rule. He leads men by the heart strings, and does not drive them. Men gladly follow him for he is unselfish and constantly has in mind their welfare and advancement, because he understands and sympathizes with the problems of the everyday man, all of which produces results and wins loyalty."

So far as we can find, Mr. McCormick has no particular hobbies. He has never lost his interest in the Houston Light Guard and is now an honorary vice-president of the Houston Light Guard Veterans Association, which was organized in 1910. The chapter of the Spanish War Veterans in Houston has been named after him. He is a charter and life member of Arabia Temple of the Shrine; a member of Scottish Rite, El Paso Consistory No. 3; a member of Knights Templar, Ruthven Commandery No. 2 of Houston, and of Gray Lodge, No. 329, A. F. & A. M., Houston. He is also a member of the Bohemian Club of San Francisco; its annual outing, known as the "Jinks," is held in the famous Bohemian Grove near San Francisco, and is widely known because of the attendance of men of national and international prominence.

In Conclusion

The men who today are climbing the ladder to greater influence and success on our railroads and in industry do not, of course, have the same backgrounds as those who got their start in the last half of the nineteenth century. Conditions in transportation and industry are radically different from those which confronted the preceding generation, and yet men like Mr. McCormick were successful in adapting themselves to the radical changes that took place over the years. To do so they had to keep their eyes and ears and minds open. They could not afford to get into a rut, or to drift along with the tide. It was a constant struggle all along the line. Likewise, the younger men of today must be keenly alert to changing conditions and new problems, which in these days are arising almost kaleidoscopically.

Fundamentally, the basic principles of good leadership do not change, although it is true that science and research are continually throwing more and more light on better methods and practices in dealing with the human element in an organization. A few rare souls seem to sense the secrets of good management. Even they can improve their ability, however, by keeping in touch with the progress which is steadily being made in our understanding of the art of personnel management and industrial leadership.

The Mechanical Engineer and Defense Transportation

(*Continued from page 5*)

a railroad had stopped applying new fireboxes and adopted the practice of patching until, after a time, many of the fireboxes on that road had become but a mass of patches. While recognizing the necessity of patching good fireboxes, particularly near the mud ring, Mr. Hall said that the result of his investigation of that particular road developed that more steel had been used in patching fireboxes than had previously been used in applying new ones.

P. W. Kiefer, chief engineer of motive power and, rolling stock, New York Central, reviewed the work of the A. A. R. in standardizing car design and K. H. Nystrom, mechanical assistant to chief operating officer, Chicago, Milwaukee, St. Paul & Pacific, made the suggestion that the use of welding could and should be extended during this emergency to speed up many of our maintenance and reclamation operations. Mr. Nystrom also ventured the suggestion that by careful planning a railroad could keep bad orders below 1.5 per cent. He said, "We can utilize freight cars to a still greater extent than we have up to the present time and obtain more miles per car per day with less cars unservicable. Mr. Nystrom also said he believed that the unservicable locomotives could be reduced to approximately half of the present 16 per cent. In commenting on this he recognized the present large percentage of unservicable locomotives as being of the older type. The question of materials and the ability to get them entered almost all discussions and the priorities system came in for its share of comment. One speaker said that reclamation should play a larger part in the immediate future and material which fails to meet specifications should not be rejected if it could be reclaimed. The attitude which railroad men might well take toward the priority system was rather well summed up by C. E. Smith, vice-president of the New Haven Road when he said, "we must get materials and we are going to get them, not solely by the harsh application of priority ratings because that cannot be done. We have got to get them by 'give-and-take'. You have heard that the priority system will be supplemented by an allocation system in cases where priorities would give all available materials to defense industries and this would deny the same material to other industries vital to defense that need them just as badly. Insofar as the railroads are concerned that job of give-and-take has been pretty well done to date."

C. C. Bailey, General Electric Company, summarized the job that all railroads will have to do from now on when he said, "in order to keep on keeping trains moving without delay maintenance and inspection should be even more exacting. Catching up with defects before they happen will make things last longer with fewer headaches. Concluding his remarks, along this line, Mr. Bailey said that turning an engine in two or three hours may build up a fine looking statistical record but if the road delays on the other side of the ledger indicate that the inspector overlooked serious defects, it is not very good railroading.

D. S. Ellis, chief mechanical officer, C. & O., said that in making use of substitute materials it should be borne in mind that no changes be required in the basic design if possible.

In commenting on the question of standardizing locomotives H. H. Urbach, mechanical assistant to executive vice-president, C. B. & Q., said that he would rather think in terms of standard locomotive parts rather than of entire locomotives. He questioned the advisability of developing standard locomotive designs.

Andrew Stevenson, chief of the Agricultural, Automotive, and Railroad Section of the Division of Civilian Supplies, O. P. M., suggested that in selecting substitute materials care be taken to insure that the substitutes themselves are not soon to become scarce. He commented particularly on the large requirements for copper in the manufacture of brass shell casings and suggested that anything the railroads could do to reduce the amount of brass required in journal bearings, or, alternatively, to help find some satisfactory substitute for brass in shell casings would be generally helpful.

John Dixon, president, Lima Locomotive Works, said that during the last war ten months were lost in the development of standard designs by the United States Railroad Administration, and expressed his approval of the A. A. R. proposal to limit locomotive orders to existing designs. The builders, he believes, will be willing to exchange existing patterns, dies, and drawings.

Frederick E. Lyford, trustee, N. Y. O. & W., said that he did not believe that we had as yet done the best with what we have available, citing the great difference in the freedom from engine failures and hot boxes which frequently can be found on immediately adjoining railroads. Speaking of the possibilities of more intensive utilization of equipment, he called attention to an increase of 9 per cent in locomotive miles per day on the N. Y. O. & W. during 10 months of 1941 over the same period for 1940.

Lawrence Richardson, mechanical assistant to vice-president and general manager, B. & M., cited examples of how common sense and ingenuity in departing from standards of loading and track alignment had permitted the movement of marine boilers over a route of restricted clearances.

Stresses in Car Wheels

(*Continued from page 14*)

Furthermore, the rosette gives the stress at the point of its location and four such rosettes equally spaced around the ring should give an accurate measure of the average stress in that ring. However, none of the values determined from the rosettes even approach the tangential stress indicated by the ring method. Since the rosette method is unaffected by the bending stresses and other effects that interfere with the ring method the former is to be preferred. As a matter of fact the ring method gives misleading results.

Appendix II

CALIBRATION OF DESHAZER GAGES

The DeShazer gage has a No. 16 Federal dial. These are calibrated with a Zeiss Optometer by Federal Products Corporation. These are guaranteed to have an accuracy of .0005 in. over a range of .200 in. Actually, however, they have a greater degree of accuracy as shown by the calibration chart in Table IV for dial No. 4F 212,692, which was used on DeShazer Gage No. 30,162. The error throughout the range fluctuated from plus to minus, the greatest error being —.00018 in. When measuring rosettes, most of the readings are taken in the middle of the range where the greatest error was +.00012 in.

The assembled gage was calibrated with a micrometer screw calibrating apparatus by the Tinius Olsen Testing Machine Company. The calibrating device was set in increments of 0.0010 in., and the corresponding DeShazer readings recorded, starting at the middle of the range of the DeShazer strain gage. These readings were taken first upward, and then downward from station 1,000 on the DeShazer gage as the starting point.

The calibration is given in Table V. As can be seen from the calibration chart, the gage constant which converts the dial reading to strain in inches per inch, will vary slightly in different parts of the range.

K is obtained by the equation $K = \dfrac{e}{d}$

Where e is the strain in inches per inch

and d is the number of dial divisions on the DeShazer corresponding to a movement of e.

For gage 30,162 for which the calibration is given, K varied from 333×10^{-7} to 334×10^{-7} and the value selected was 334×10^{-7}.

EDITORIALS

For Our Country

The problem of financing national defense and the war and keeping our economy in proper balance, is one of no mean proportions. The Treasury Department at Washington has given this matter critical study and believes that it is quite essential that the public at large purchase defense bonds and stamps to the limit of the ability of every individual in the nation. This will enable each one of us, also, to have at least a small part in helping out in the grave emergency which confronts the United States.

A statement, elsewhere in this issue, explains and outlines a plan that is being urged by the Treasury Department, and in the promotion of which we can be helpful. Where it is not available contributions can be made in other ways. The *Railway Mechanical Engineer* urges its readers to do their part in promoting the sale of defense bonds and stamps. Bonds cost as little as $18.75 and stamps are obtainable in denominations as low as ten cents. Every cent counts!

Contest Closes January 15

Don't forget to mail your contribution to our prize competition on "ways and means of improving the mechanical department's operations or practices to increase production and secure a larger use from the equipment and facilities." Articles that are mailed on January 15 and bear a postmark before midnight of that day, will be eligible.

This contest, first announced in our October, 1941, issue, is of even greater import now that our country has been drawn into the Second World War. The material situation, which is growing more and more stringent as the months pass, has proved to be a bottleneck in the production of much needed cars and locomotives. Authorities at Washington seem to recognize the prime importance of the railroads in the emergency, and the indications are that they will do what they can to assist the railroads by diverting to their needs some of the scarce materials that are now so much needed for defense and war purposes. Not too much should be expected in that way, however, and special efforts must be made to secure a greater and more effective use of such facilities and equipment as are now available. This cannot be achieved by ordinary methods or the usual practices. It will require real ingenuity and the hardest kind of effort.

We hope that the contest has already proved of material benefit by stimulating thinking and effort in the right directions. We are hopeful, also, that the suggestions that will come to us will be of such a practical nature, from the standpoint of quick relief or benefit, that their application will help materially to still further increase the efficiency and effectiveness of the mechanical departments of our railroads.

More Intensive Freight-Car Use Essential In the New Year

An authoritative spokesman of the Association of American Railroads recently made the statement that the average freight car is in motion about 2½ hr. out of 24, which is a utilization on a time basis of only slightly over 10 per cent. Obviously, therefore, the important thing about freight cars is not so much how fast they are operated in trains on the road, but what happens to delay them at yards, terminals, repair shops, shippers' tracks, etc. Concentrated attention to every detail of freight-car non-operating time is essential if this percentage utilization is to be brought anywhere nearly up to the point where it should be. The indications are that railways will find it difficult or impossible to secure all of the new freight car equipment which they want in 1942, and if freight cars could be kept on the move only one-half hour more per day on the average, it would apparently have the effect of increasing the freight car inventory 20 per cent.

Railway motive power officers play an important role by providing adequate motive power in condition to handle trains safely at modern high-operating speeds; also by supplying ample switching locomotives for the prompt handling of cars at terminals and industry tracks, the switching movement not being made so fast, however, that cars are damaged and subsequently delayed for repairs. In the field of train operation, locomotive crews and their supervisory officers have a grand opportunity to increase the service secured from freight cars by the exercise of good judgment in minimizing delays as well as maintaining high sustained speeds while in operation.

By and large, however, the more effective use of freight-car equipment is dependent primarily upon the efficiency of car-department forces charged with the responsibility of freight-car design, inspection and maintenance. Car men can perhaps do more than any other single group by a concerted effort to increase the daily mileage and utilization of freight cars. The things which need most to be done have been emphasized officially several times in recent months but nowhere more concisely and pointedly than in the address "Reminders for Better Railroading," presented by C. J. Nelson, superintendent of interchange, Chicago Car Interchange Bureau, at the November 18 meeting of the Car Department Association of St. Louis, when he received the honor award given annually by this Association for distinguished achievement in the car field.

Mr. Nelson said that of about 36,000,000 cars loaded with revenue freight in the United States in 1940, over 1,000,000 of that number, not counting disarranged loads, were received in interchange in such condition that they had to be shopped for repairs. In the Chicago terminal, this ratio was 1 in 40 in 1932, and an intensive campaign has now reduced it to 1 in about 130, which still leaves plenty of room for improvement.

An inspection of defective material removed from loaded cars indicates that at least 50 per cent of the defects which necessitated shopping, were in existence before the cars were loaded. The answer to this problem rests largely in the inspection of empty cars with the same exacting care as loaded cars at interchange points. Another great improvement which can be made is in the shopping of fewer loaded cars when received in interchange with minor defects which have little if any bearing on safe operation. The ratio of loaded cars shopped to those received varies from 1 in 30 on some connecting carriers to 1 in 600 on others. If railroads with the low ratio mentioned are following the correct inspection practice, as would seem to be indicated by general freedom from difficulty in getting the loaded cars through to destination, it is obvious that car supervisors and inspectors on railroads with the high ratio are placing too much emphasis on technicalities of the rules of interchange and, in an effort to avoid personal responsibility and possible criticism, are overlooking their main duty which is to transmit loads to destination with the least possible delay consistent with safety. It is evident that an intensive campaign of instruction and morale building is required if these car supervisors and inspectors are to function with maximum efficiency in avoiding delays to loaded cars.

A large proportion of all loaded cars shopped for repairs have to be taken out of service due to defective wheels, chill wear being responsible for most of the necessary wheel changes. The recent action of the A. A. R. in adopting a gage to show definitely when a worn-through-chill car wheel shall be removed and when it shall not be removed from loaded cars, should prove a very effective action in preventing delays to loaded cars. The effect of this gage is to reduce the condemning limit to $\frac{3}{64}$ in. wear in the case of loaded cars and give car inspectors a gage, the use of which will practically eliminate entirely the judgment feature.

The improper loading of open-top cars is another source of delay and loss of life and property, which should be analyzed and steps taken to remove the contributory causes which consist primarily of a lack of knowledge of the A. A. R. loading rules, both by shippers and many railway employees, and the fact that the competitive feature enables unscrupulous shippers to play one railroad against another and thus sometimes cause the acceptance of questionable loads for movement in high-speed freight service. No one contends that the A. A. R. loading rules are perfect and they are constantly in the process of being reviewed and revised in certain details which need to be improved. There is no excuse for partiality, however, and when steel shippers, for example, receive dangerous loads of scrap iron, not secured in accordance with the approved loading rules, they naturally ask why the railroads are so exacting with steel shipments and sometimes so lenient with loads of scrap iron.

The specific recommendations in Mr. Nelson's paper deserve more than consideration and study. They should be acted on promptly to make sure (1) that greater efforts be made to keep empty cars in suitable repair for carrying loads to destination without being shopped enroute; (2) that no loaded cars be shopped unless absolutely necessary for safety or compliance with the law; (3) that chief mechanical officers keep records of all loaded cars shopped on their respective systems, with the view of keeping constant checks for improved performance; (4) that car supervisors ascertain, beyond doubt, that all employees having to do with the loading of freight cars are fully familiar with the A. A. R. loading rules; and (5) that agreements be made to the effect that, at points where two or more railroads serve one and the same shipper, cars or loads rejected by one railroad will not be accepted by another.

Two Car-Department Responsibilities

In the course of an unusually pertinent discussion of freight-car loading rules at a recent meeting of the Northwest Carmen's Association, M. E. Fitzgerald, master car builder, Chicago & Eastern Illinois, emphasized two primary responsibilities of railway car departments, namely: To inspect cars and see that they are in suitable condition to carry loads to destination; also to inspect loads and see that they are properly and safely secured before being accepted from the shipper. Both of these responsibilities do or should belong definitely to the originating carrier and, as Mr. Fitzgerald so clearly pointed out, if they are fairly met, most of the current pressing problems associated with

the interchange of cars and the safe movement of freight shipments will be solved.

The trouble is that much remains to be done in the instruction of both car inspection forces and shippers. Many of the former do not have a full understanding of the distinction between car conditions absolutely essential for safe operation and those which need not be so highly stressed when it is a question of getting loaded cars through to destination without the delay and cost incident to sending them to repair tracks. It is said that some shippers do not even have copies of the A. A. R. loading rules which, in themselves, are subject to constant revision in the interests of more safe and efficient loading. Apparently the products now causing particular difficulty in shipment include long poles, logs and lumber loaded on open top cars; steel billets, sheets and pipe; heavy machinery, whether pivoted or not; scrap iron; and various commodities shipped in tank cars which are not always loaded in accordance with I. C. C. regulations.

It cannot be questioned that many thousands of dollars, expended by the railroads today for freight claims, transfers or adjustments, to say nothing of train delays, as a result of continuing defective or obsolete cars in service, could be more profitably utilized in repairs or for new equipment. Mr. Fitzgerald commented on this feature and closed his paper with the three following suggestions: See that only good cars are set for loading; study industry requirements on the respective lines and see that individual shippers have copies of the loading rules and are familiar with the latest requirements governing shipment of their commodities; and train special men at large terminals to supervise industry loading and be available for sending to smaller points on advance notice that commodities involving special difficulty in handling are to be loaded.

Standardization — Now and Twenty-Five Years Ago

One of the most frequently mentioned subjects at the railroad sessions of the annual meeting of the American Society of Mechanical Engineers, in a discussion of railroad transportation during the national emergency, was standardization of freight cars and locomotives. The prevailing opinion was favorable to a method of dealing with the need for conservation of materials, time, and shop facilities which disturbs the status quo and the exercise of free choice on the part of the railroads as little as possible, although there are still those who would like to see steam locomotives reduced to standard types as was done by the United States Railroad Administration during the first World War.

So far as it affects the amount of materials and builders' plant capacity required, the present situation is far more acute than that at the outset of our entrance into the first World War. The present approach to this problem, however, has been of a far simpler and less disturbing nature than that during the last war. Then, the United States Railroad Administration appointed committees representing the builders to study the question of standard designs of both freight cars and locomotives during the summer of 1917; these committees reported early in 1918 with recommended designs from which, after they had been submitted to committees of regional officers of the Railroad Administration for comment and criticism, orders were placed with the builders at the end of April. Freight cars built on these orders began to come out of the plants in quantity in September and deliveries on orders from only three of the twelve standard locomotive types had been made by that time.

The United States declared war on Germany on April 6, 1917. It was seventeen months later before equipment on U. S. R. A. orders were delivered in quantity. Our participation in the war lasted a few days more than nineteen months.

In our present war emergency, with its tremendously greater demands upon our industrial system for the production of the implements of war, had any such process of standardization been undertaken, it is probable that the materials for the building of railway cars and locomotives would have ceased to be available before the first orders could be placed. Indeed, to wait for equipment while the process of developing standard designs ran its tedious course would probably prove fatal to the adequacy of railway transportation.

Of course, we are not entirely without standard designs at the present time. There is the 40-ft. 6-in. steel-sheathed wood-lined box car adopted as standard by the A. R. A. in 1932, followed by 50-ton and 70-ton hopper cars, another 40-ft. 6-in. box car of increased dimensions, and a 50-ft. 6-in. box car of large interior and clear height dimensions—all cars, the designs of which have been widely accepted by the railroads. For the remainder of the thirteen designs to which the railroads have pledged themselves to confine their freight-car orders during the emergency, no accepted standards are available. To meet the needs for cars of these types the Association of American Railroads has taken a common-sense course of accepting existing designs for which patterns, jigs, templates, etc., are already available. It has, in effect, accepted these existing designs as temporary standards.

In the case of locomotives, which do not go into interchange, not even this degree of standardization has been adopted. Confining future orders to existing designs and combining small orders meets the essential requirements of the builders and of material conservation.

The highly important fact in the present situation is that the ordering of material and building of equipment need in no case await the development of a design and material requirements can be quickly and accurately estimated.

St. Louis Refrigerator Car Shop Kinks

A number of labor-saving devices used at the St. Louis, Mo., shops of the St. Louis Refrigerator Car Company, are shown in the illustrations. Referring to the first view, floor racks are made on a table jig, the top boards being cut to length by an electric hand saw and the completed rack lifted with the monorail and chain hoist to the storage position, illustrated. While suspended in the air the floor racks are sprayed with a mineral red paint. From the storage position, the floor racks are again lifted with the chain falls, pushed out of the shop on the monorail extension shown in one of the photographs and

Monorail hoist used in handling floor racks at the St. Louis Refrigerator Car Company's shops

loaded on a truck for removal to the individual refrigerator cars where they are to be used.

These floor racks are made of oak and each unit weighs approximately 400 lb., requiring four men to handle it readily without the use of a mechanical hoist. The monorail hoist is made of a 6-in. I-beam, equipped with a ½-ton chain hoist and extended out of the shop 10 ft. to permit loading trucks or trailers placed on the cross walk at the end of the shop.

Referring to the second view, a universal portable variety saw, made by the Crescent Machine Company, Leftonia, Ohio, is being used for combination rip or cross-cut sawing at any point wherever needed throughout the shop. This saw is driven by a 7½-hp. electric motor with a 25-ft. cord extension to be plugged in at any convenient socket. The saw itself is 18 in. in diameter, with teeth cut for either rip or cross-cut sawing and protected by a totally enclosed safety guard so that it may be used with safety by any car man who has a quick job of sawing to do.

The principal advantage of this portable saw is that it may be located adjacent to a pile of lumber and used for squaring and cutting off siding, flooring, lining, roof sheathing, etc., without the necessity of loading this lumber on a truck, moving it to the mill, unloading it, sawing, re-loading and moving it to the car. Instead, the lumber is simply moved directly from the pile, one piece at a time to this portable saw, from which it is loaded on a truck and in a single additional movement placed ad-

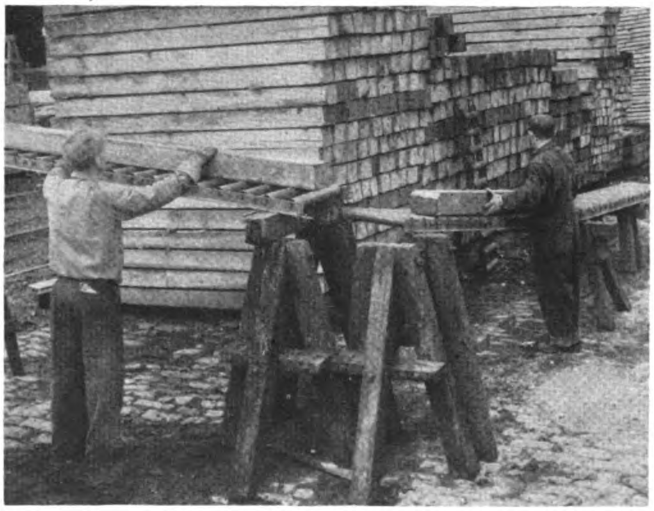
Crescent universal portable variety saw which saves time on many small sawing jobs

jacent to the car on which the lumber is to be applied.

All that is necessary in moving this portable saw is to pull out the two wooden handles, illustrated, press down and engage a notch which puts the wheels in rolling position and then reverse this operation after the saw has been located where it is to be used. The 25-ft. electric extension cord may be plugged into an ordinary socket at any post throughout the shop.

Considerable thought has been given to every phase of lumber handling to reduce the manual labor and also save unnecessary steps at the St. Louis Refrigerator Car Company's shop. With this shop located in the center of an extremely busy manufacturing district in St. Louis, storage space in the lumber yard is at a premium and lumber is handled and piled in such a way as to utilize this space to the maximum advantage and also conserve the physical efforts of the yard crew which does the work.

For example, roller conveyors, shown in one of the



Roller conveyors are a great labor saver in unloading cars of heavy lumber

illustrations, are used effectively to reduce the labor in handling lumber from the incoming car to the storage piles. Heavy oak timbers are received in various sizes from 3 in. by 3 in. up to 8 in. by 8 in., and 9 ft. long, all frequently loaded in the same car and now very easily and conveniently unloaded by means of the roller conveyor sections, illustrated. The first roller section is placed on horses with one end extending into the car door and the other intersecting cross sections which are inclined, usually both ways along the aisle between lumber piles so that timbers of various sizes may be directed either to the right or to the left, dependent upon the direction it needs to move for storage in the lumber pile of that particular size. With one man in the car and one or more available to take away from the roller conveyor, a car can now be unloaded and the heavy timbers placed in their respective piles in a fraction of the time formerly required.

The roller sections are available in different lengths up to 20 ft., being made of 2-in. side angles with 3-in. ball-bearing rolls, 18 in. long, spaced on about 8-in. centers. The use of these roller sections saves a large amount of work in lifting and carrying heavy timbers which, particularly on hot days, men find it difficult to perform continuously without mechanical assistance.

The other two illustrations show a Krane Kar, Model A, gasoline-operated machine, two of which are used for

Wood refuse box being dumped by a gasoline-operated Krane Kar with 18-ft. boom

Another view of the Krane Kar moving one of the metal drums filled with scrap steel

a great variety of operations at the St. Louis car shop, including the lifting of heavy material, loading and unloading cars of bulky materials, spotting cars, hauling trailers, etc. Each machine is equipped with a 12-ft. boom having an extension of an additional 6 ft. available when needed. It is designed to lift 5,000 lb. at 3½ ft. radius and owing to the use of small closely spaced double-rear wheels is designed to turn in its own length. The effectiveness of the Krane Kar has been greatly increased at the St. Louis car shop during the last 12 months by the installation of concrete walkways, one of which is shown in the illustration.

In one of the views, a wood refuse box is shown being unloaded into a scrap car. This box is one of several, 4 ft. wide by 18 in. high by 9 ft. long, having one end open and being equipped with a ring at each corner for attachment of the four-chain hook and ring which engages the crane hook. With these refuse wood boxes located at convenient points throughout the shops, scrap wood and refuse is thrown into them instead of on the floor and when the boxes are filled, they are taken one at a time to the scrap car where the release of the two forward chains enables the Krane Kar operator to dump the box without additional help and thus save an awkward hand-unloading job.

Similarly, "one-trip" sheet metal drums are located conveniently throughout the shops to receive scrap iron which is moved to the scrap yard and loaded into the car directly from the drum without re-handling, regardless of weight. Two holes are punched in the side of the drum near the top for attachment of a double crane hook so that the Krane Kar can readily lift the drum and handle it to the scrap car. Punchings, rivet heads and springs are placed in one drum, cast iron in another, malleable iron in another and in this way considerable labor is saved in sorting the scrap material. Bolsters are handled two at a time with this crane, the weight being about 1,200 lb.; also four couplers weighing 1,600 lb. The metal drums when loaded with scrap iron or steel castings weigh from 500 to 800 lb.

Passenger Car and Coach Yard Sanitation

*By N. J. Capaldo**

In the cleaning of passenger cars one of the most important requirements is sanitation, which might be classified as the health department work of the railroad.

* Clerk and extra-gang foreman, Terminal Railroad Association of St. Louis. Mr. Capaldo's paper, abstracted above, was awarded first prize as the best of seven short papers presented by car men from the ranks before the Car Dept. Association of St. Louis during the last year.

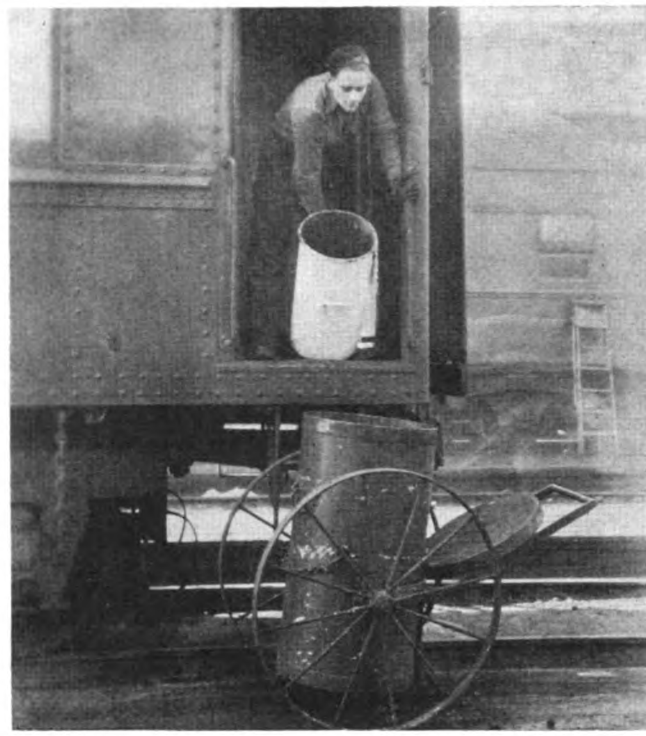
Now many of us have ridden on the passenger carrying equipment of a railroad and have taken it as a matter of course that the cars would be cleaned, watered and in a sanitary condition, but how many have given thought to the great care and the requirements which are necessary to keep passenger cars in a sanitary and healthful condition. It is my observation that the traveling public after boarding a car and having selected a seat, invariably have a desire to get a drink of water. The first thing they see is the sanitary paper cups in a sanitary holder next to the drinking-water container. In drawing a cup of water the public, as a whole, does not give thought to the fact that the railroads are always on the alert and ever watchful to see that the water supplied cars for public consumption is the purest, yes we might even say that it is purer than city water. In supplying passenger cars with water we of course use the water furnished by the city, which is put in the cars with a water hose, the nozzle of which is always capped when not in use. The water is put into tanks on the cars from which it is diverted for the various uses, such as toilets, wash stands and drinking fountains. The water to the drinking fountains is piped to a filter in the fountains through which it passes to the outlet; therefore you can readily see that the railroads re-filter the pure city water before passing it on to the public. Now, in order to maintain the filters and coolers in a first-class sanitary condition, it is necessary that we remove the filter stones at least once each week and thoroughly steam and clean them on the steam table which is solely provided for this purpose. I am satisfied however, that we can make some further improvement in the drinking-water arrangement. I believe that a mechanical cooling system for drinking water fountains can be devised along the line of the air-conditioning system, which no doubt would result in a saving of both labor and material.

Fumigation Equipment Suggested for Each Car

With the advent of the air-conditioned cars, the railroads have further contributed to the health of the public, not only by the cooling of cars in warm weather and heating of cars in cold weather, but by the continuous circulating of fresh pure air throughout the cars. However, because food is brought in by passengers, the cars may become more or less infested with vermin and flies. This has to be overcome by frequent fumigation with an insecticide and a mechanical or electric spray gun. This we find to be very effective in the eradiation of all vermin. However, as the insecticide used is in liquid form, and the mechanical or electric guns have connections outside of the car, provisions could be made in one end of the car whereby the insecticide and spray gun could be placed and made a part of the car equipment. The cars then could be fumigated by the regular car cleaner at each end of the line and just prior to the cleaning of the car.

In recent years railroad coach travel has greatly increased due in a large measure to lower rates, modern de-luxe equipment and the many innovations offered by the railroads. One of the many inducements offered to night coach passengers is the free pillow service, an inducement that is very popular with the traveling public. However, it has been my observation that after the use of these pillows, some of the slips were soiled from perspiration, oily substances, dirt, etc., and in some cases this has penetrated into the pillows. Clean pillow slips alone do not restore satisfactory sanitary conditions as it is a fact that heat from individuals who might be resting their heads upon the pillow would have a tendency to draw from the pillow any substance or disease that might have penetrated into the pillow. A suitable covering such as cellophane or a similar material that is nonporous and will not crackle, used to cover the pillow ticking proper, would be ideal from a sanitary point of view.

There are many more functions for the maintaining of sanitary conditions in railroad cars, such as the disinfecting of toilets, the mopping of floors, the cleaning of wash stands, flushing of water tanks etc., which in my opinion could be classified as necessary health precautions of the railroads.



Two-wheel container and cover used in disposing of dining car garbage in a coach yard

In the interest of sanitation, it would be my recommendation that toilets, both men's and women's, should be increased in size and constructed in such a manner to effect perfect ventilation; side walls and floors and fixtures be of materials that can be easily cleaned; hoppers be set out from the wall sufficiently to permit cleaning behind them more easily.

All coaches and chair cars should be completely covered with floor covering of rubber tiling or linoleum, for sanitary reasons, and to cut down on expense of keeping painted floors in proper condition.

Steam heating pipes should not run behind hoppers, as it creates a condition that is almost impossible to clean thoroughly.

Windows should be arranged so that they can be completely opened for cleaning and I would recommend that a piano hinge arrangement be used for this purpose, so that the windows can be opened from the inside and thus permit thorough cleaning of the windows. This would do away with the present method of using jacks to open windows, which mars the window sills and eventually necessitates refinishing.

I would also recommend what I believe would add to the safety of the traveling public, in the following suggestions:

Four Specific Suggestions

Vestibule steps should be made standard both for width and tread, and the amount of each, i. e., all steps to

have either four or five treads. This standardization I feel would add to the safety of not only passengers, but to carmen and car cleaners who make many trips in and out of cars.

Thought should be given to the proper floor lighting of all cars, particularly of aisles, in order to furnish sufficient illumination for safe walking, especially at night or when the top lights are dimmed.

Spacing of seats in cars should be sufficient to allow for the comfort of passengers. This would eliminate the use of the back of seats for foot rests and would provide in some degree, room for small luggage.

In the narrow hallways, where cars are equipped with smoking or rest rooms, entrances should be of sufficient width to permit carrying luggage through without marring partitions or side walls. If this cannot be done, materials should be used on the side walls that will not dent or scar. Experience has shown how expensive it is to keep painted surfaces in presentable condition.

Air Brake Questions and Answers

(AB-8, Empty and Load Equipment Continued)

65—*Q.—What position is the change-over piston in and what keeps it there?* A.—Spring *25* moves the latch piston to the locking position, causing latch *27* to move to a position which will retain the change-over piston in the empty position.

66—*Q.—What possibilities are there of false changes in setting while the car is in motion?* A.—None. The strut cylinder piston spring *5* raises piston *3* and attached shoe *6* away from contact with the piston stop.

67—*Q.—How is the air vented from the face of the large change-over piston?* A.—When the strut cylinder piston is moved to its upper position, the port connecting with pipe *4* is therefore connected to the atmosphere through an exhaust port and the wasp excluder fitting.

68—*Q.—Where is this exhaust port located?* A.—In the non-pressure end of the strut cylinder.

69—*Q.—In the event that an uncharged car is connected to a charged brake pipe, does the change-over valve have sufficient time to assume its proper position?* A.—Yes. There is a choke, *103*, in the change-over valve pipe bracket which serves to provide a predetermined time for charging the strut cylinder volume. This arrangement gives the change-over valve the required time.

70—*Q.—On the AB quick service and emergency transmission, what provides against any slowing up effect of pipe 11 on this transmission?* A.—Choke *25* (Fig. 4) in the ABEL-1 valve bracket, connected to this pipe, provides for such a contingency.

71—*Q.—Referring to Plate 3. With the change-over valve in the empty position, what position is the transfer valve in during a brake application?* A.—In its upper position, due to the force of its spring in addition to air pressure.

72—*Q.—What serves to hold the change-over slide valve on its seat?* A.—Air from passage *3* flows through passage *3b* to a diaphram which by means of strut *10* holds the slide valve seated.

73—*Q.—With the equipment in empty position, is there a possibility of pressure development in the load cylinder?* A.—No. Exhaust port *At* is connected permanently to change-over slide valve chamber *B*, which connects with passage *8*, leading to the load cylinder.

74—*Q.—In what direction does release take place in the event that the equipment is in empty position?* A.—In an opposite direction.

75—*Q.—When the brake pipe pressure is reduced below 30 lb., what must be done before the change-over valve changes position?* A.—Car loading must be changed.

76—*Q.—Referring to Plate 1. With the car more than half loaded, and the brake pipe pressure building up, is the operation of the cut-off valve and latch piston of the change-over valve similar to that of an empty car?* A.—It is the same.

77—*Q.—What serves to hold the piston and slide valve in load position?* A.—The truck member to which the strut cylinder is bolted is closer to the piston stop when the car is loaded, which reduces the travel of the strut cylinder piston. Such being the case, no air is admitted to pipe *4* as the piston does not uncover the port.

78—*Q.—Referring to Plate 2. Describe the "release and full charge" (load) position?* A.—After the brake pipe pressure builds up in excess of 30 lb., air pressure is vented from the change-over portion by the cut-off valve, and the latch holds the change-over piston and slide valve in load position until a change takes place in the loading of the car and the brake-pipe pressure is reduced again to below 30 lb. In load position of the change-over slide valve passage *7* is uncovered and connected to the slide valve chamber exhaust port *At*. This connects the brake cylinder volume in the change-over pipe bracket and the spring side, passage *7a*, of transfer piston *41*, to the atmosphere.

79—*Q.—Describe the brake application in "load" position.* A.—Referring to Plate 4. Air from the AB valve is connected to the empty brake cylinder until 20 lb. pressure is developed, which is sufficient to cause the transfer piston to break its upper seal and move to the lower seal.

80—*Q.—Is air free to flow at this time from the empty to the load cylinder?* A.—No. Due to the seating of check valve *47*, cutting off communication between the two cylinders.

81—*Q.—Is there any communication between the ABEL-1 valve and the load cylinder at this time?* A.—Yes. By way of the transfer valve and the change-over slide valve.

82—*Q.—When is check valve 47 unseated and what happens?* A.—When the pressure in the load cylinder is slightly more than that in the empty cylinder, air from the ABEL-1 valve is connected to both cylinders.

83—*Q.—What valve functions to admit air to the load cylinder in the event that the supply of air from the ABEL-1 valve is stopped?* A.—Release check valve *51* opens to permit air to pass from the empty brake cylinder through various passages and past the transfer valve to the load cylinder.

Maintenance of AB Empty and Load Equipment

84—*Q.—What instructions should be followed when cleaning the AB empty and load freight brake equipment on repair tracks?* A.—The same instructions and procedure as followed for cleaning and testing the AB brakes.

85—*Q.—What should each brake cleaning gang be provided with?* A.—A grease can so arranged that both the grease and brush can be protected against dirt, one extra set of shipping caps for the various valve portions; a blower hose and suitable tools.

86—*Q.—What kind of tools should be provided.* A.—Referring to Fig. 1 (Instruction leaflet No. 2391. Supplement 1). A combination socket wrench set for AB valve portions, flange fittings and brake cylinder non-

pressure head. This set consists of a ratchet-type handle, two extensions, a universal joint and five sockets, viz. $\frac{9}{16}$ in., $\frac{5}{8}$ in., $\frac{3}{4}$ in., $\frac{13}{16}$ in. and 1 in. (The $\frac{13}{16}$ in. socket is required only for the empty and load change-over valve); a strainer nut wrench, and open end S wrench with $\frac{3}{4}$ in. and $\frac{13}{16}$ in. openings for dirt collector branch pipe tee and cut-out cock; a blower nozzle valve with suitable $\frac{1}{4}$ in. pipe nipple nozzle for blower hose; a vent protector plug (Fig. 3) and suitable scrapers.

Two Straightening Devices

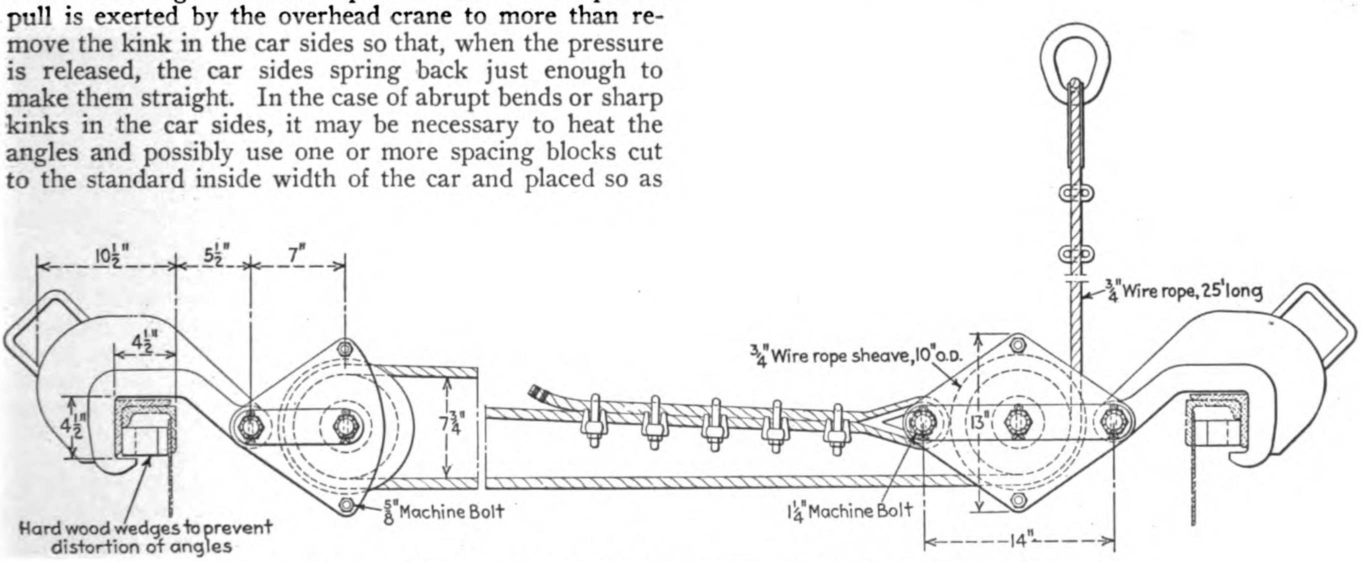
Two convenient devices, for straightening steel car sides and end gates, respectively, are shown in the drawings.

When the sides of a steel gondola car are bulged outward due to overloading, abuse with a clam shell while unloading, or any other cause, they may be easily straightened and brought back into the correct alinement by means of the device shown in the first drawing. This consists of two heavy hooks, bolted to single-sheave pulleys which are connected by a double strand of $\frac{3}{4}$-in. wire rope in such a way that the upward pull of a shop or locomotive crane on one end of the wire rope exerts twice that amount of pressure in pulling the car sides together.

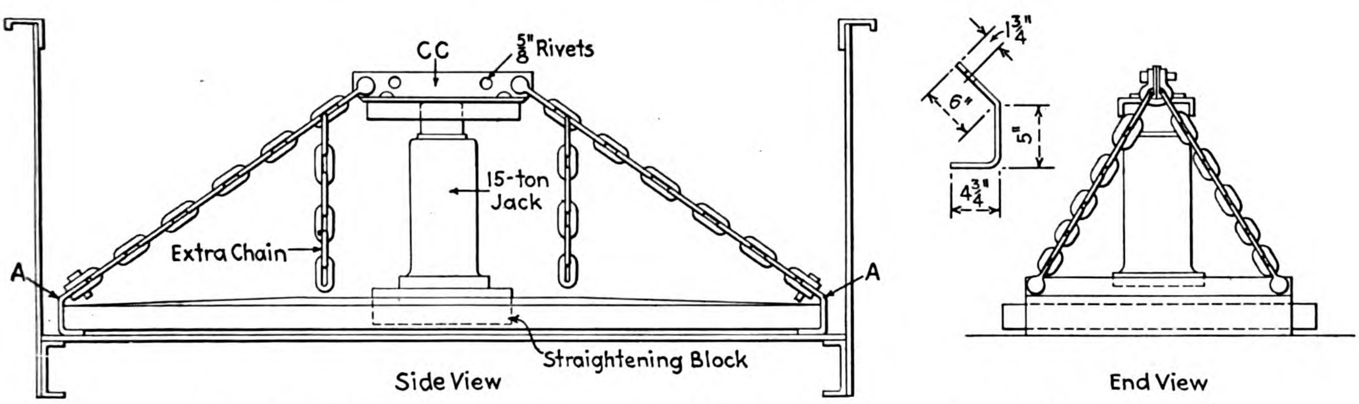
Hardwood wedges are applied, as shown in the drawing, to prevent distortion of the car side angles over which the large hooks are placed. Sufficient upward pull is exerted by the overhead crane to more than remove the kink in the car sides so that, when the pressure is released, the car sides spring back just enough to make them straight. In the case of abrupt bends or sharp kinks in the car sides, it may be necessary to heat the angles and possibly use one or more spacing blocks cut to the standard inside width of the car and placed so as to bring the pressure on the car sides just where it is needed.

The single-pulley sheaves, with 10 in. outside diameter and $7\frac{3}{4}$ in. groove diameter, have a $1\frac{1}{4}$-in. bore and a $1\frac{3}{4}$-in. hub length, being equipped with self-lubricating bushings. For safety and ease in handling, the hooks are equipped with welded hand holds made of $\frac{5}{8}$-in. round steel. The cable is 25 ft. long, is anchored to a pulley block at one end by means of wire rope clips and a thimble, and is equipped with a wire rope thimble and elongated steel ring at the other end for attachment to the overhead crane.

Referring to the second drawing, it will be noted that the 15-ton jack and special chain equipment shown can be readily used for straightening the end gates of drop-end gondola cars. Two hooks, made of $\frac{3}{4}$-in. steel plate, 36 in. long, are bent to the shape, shown at *AA* and placed under the edges of the bent door. Two connector angles *CC,* made of $3\frac{1}{2}$-in. angles 23 in. long, are placed back to back and drilled with $\frac{11}{16}$-in. holes near each end for the attachment of $\frac{3}{4}$-in. clevis and chain connection to hooks *AA* at each corner of the door. The angles *CC* are riveted to an 8-in. channel, 21 in. long, which is supported on the ram of the jack, the base resting on a 3-in. by 4-in. straightening block which has rounded corners and fits in one of the corrugations of the end gate. By exerting as much pressure as may be required with the 15-ton jack, shown in the drawing, the end gate can be readily straightened in a minimum time, and without removing it from the car.



Device which may be effectively used in straightening the sides of steel gondola or hopper cars



Device for straightening bent end gates without the delay and expense of removing them from the car

Improved Method for Checking

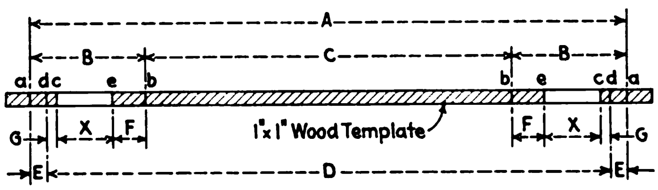
Alignment of Running Gear*

Part II

Checking Driver Lateral to Determine Thickness of Hub Liners on Boxes

With the driving box centers properly squared and the shoes and wedges laid off, the correct alignment of the driving wheels depends on the correct thickness of the driving box hub liners. This is determined from the long straight edges on which all alignment and squaring operations are based.

The method of checking the driver lateral to determine the hub liner thickness is shown in Fig. 7 and is performed for each pair of drivers at its frame pedestal. A wooden template approximately 1 in. by 1 in. in size, with length to suit, is used for this purpose. Lay off on the template the distance *A* between the outside edges of the long straight edges and mark points *a*. From these points, lay off distance *B* at each end from the outside edge of the straight edge to the outside face of the pedestal on each side and mark points *b*. Then *C* should equal the distance between the outside faces of the pedestals.



A—Distance between outside edges of long straight edges shown in Fig. 1.
B—Distance from outside edge of long straight edge to outside face of pedestal.
C—Distance between outside pedestal faces.
D—Distance between hub faces on driving wheels.
E—Equal distance from outside edge of straight edge on each side.
F—Thickness of shoe and wedge flanges.
G—One half total lateral allowed on drivers.
X—Thickness of driving box hub liner.

Fig. 7—Wood template for checking lateral to determine hub liner thickness

Assuming that the tires are correctly set to gage on the wheel centers, lay off on the template the distance *D* between the hub faces of the driving wheels, taking care to center this distance between points *a* and mark the two points *d*. The distance should be equal at each end of the template.

From points *b*, lay off *F* equal to the thickness of the flanges on the shoes and wedges and mark these points *e*. Lay off the distance *G* from points *d* equal to one half the total lateral play to be allowed on the drivers, and mark the points *c*.

The distance *X* between points *c* and *e* will then be the correct thickness for the hub liners on the driving boxes to secure proper alignment of the driving wheels.

Squaring and Checking Alignment of Engine or Pony Truck

The method of squaring and checking alignment of four-wheel engine trucks is shown in Fig. 8.

Remove the pedestal liners, wedge a wooden block between each pair of pedestal jaws, as shown at *B*, and locate the pedestal center on this board. Clamp a straight edge to the front and back pedestal jaws with its top edge an equal distance from the bottom of each jaw, as shown at *X*. Transfer all four pedestal centers from the wooden blocks to the top of the frame, by means of a try square set on the straight edge, and prick-punch as shown at *C*.

Set a straight edge to the prick punch marks at the top of the frame and scribe a line across the top of the frame, as shown at *D*, on both sides, front and back. Then prick punch new center points on this line an equal distance from the inside face of each pedestal as shown at *A*.

Check the diagonal distance between points *A* at opposite corners of the frame. If both diagonals are equal the frame is square.

Check the distance between the top and bottom of the jaw faces at each pedestal to see that the jaws are parallel.

Check the lateral across the opposite pedestals at the top, bottom and center, to determine if the frame is bowed or sprung vertically, prick punch a mark 1 in. from the pedestal face and 2 in. from the end of the face at the top and bottom at each end of the frame, as shown at *E*, on both sides. The distances between the two upper points should be equal to the distance between the two lower points on each side of the frame, if the frame is straight.

To check the location of the female center casting, it should be set at the true center of the rocker swing. This is accomplished by setting it mid-way between the centers which the rockers seek when released from their extreme travel position on each side. Care should be taken to see that the rocker displacement is not due

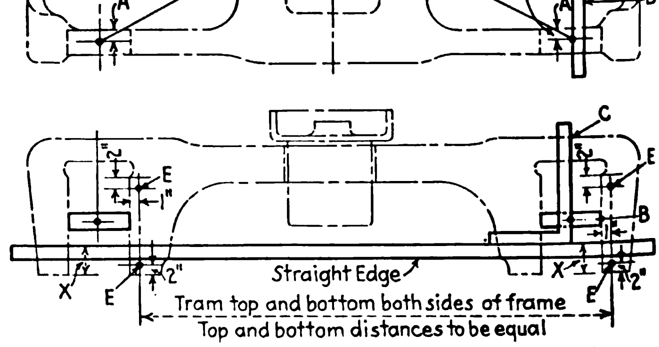


Fig. 8—Checking alignment of four-wheel engine truck

* Abstract of a report presented at the annual meeting of the Locomotive Maintenance Officers' Association at the Hotel Sherman, Chicago, September 23-24, 1941, Part I of which appeared in the December, 1941, issue.

to dirt or other foreign matter between the rockers and seats. When set, check with the tram from the pedestal center points *A*. All arcs scribed by the tram should intersect at a common point at the center of the female center casting.

As a further check on the center casting and rockers or swing links, level the frame crosswise and lengthwise and check the center bearing surface to see that it is level with the frame. The contours of the rocker surfaces should be checked with a suitable gage in order to maintain the correct lateral resistance of the truck on the curves.

The method of checking the alignment of a two-wheel pony truck is shown in Fig. 9.

The pedestal liners should be removed and the pedestal faces checked with a straight edge for being square and parallel. The truck frame is then leveled both crosswise and lengthwise.

Apply a straight edge, having adjustable center blocks, across the pedestal faces as shown at *A*. The correct

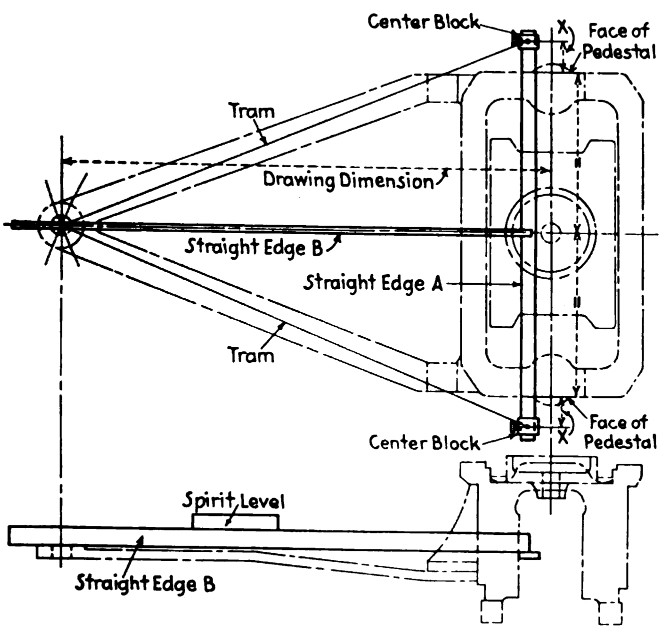


Fig. 9—Checking alignment of two-wheel engine truck

location of this straight edge is determined by laying another straight edge across its mid-point and the radius-bar pivot center, as shown at *B*, and raising or lowering straight edge *A* until straight edge *B* is level, as indicated by a spirit level. Straight edge *A* is then at the correct height in the pedestal. It should be cross-leveled and clamped in position after which the adjustable block centers should be set an equal distance *X* from the pedestal faces on each side of the frame.

Then tram from the black centers to the radius bar pivot. The arcs scribed by the tram should intersect close to the center of the pivot pin hole.

Check the location of the king-pin center for being centered in the truck frame and check the distance between the king-pin center and the radius-bar pivot center. This should agree closely with the drawing dimension.

Squaring and Checking Alignment of Trailer Truck

The method of checking the alignment of a two-wheel Delta-type trailer truck is shown in Fig. 10.

The truck frame should be leveled, the pedestal liners removed and the pedestal faces checked with a straight

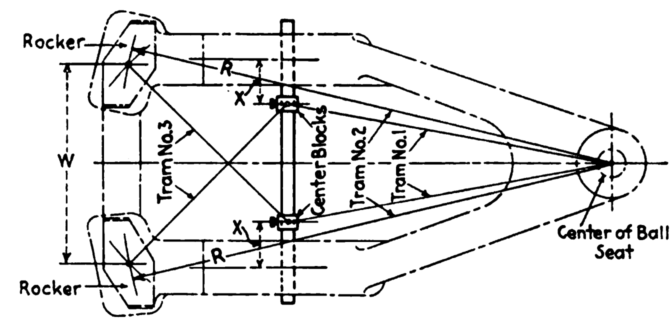


Fig. 10—Method of checking two-wheel trailer truck

edge for being square and parallel. Then apply a straight edge having adjustable center blocks, across the pedestal faces as shown. This straight edge should be leveled with the frame and the block centers adjusted to equal distances *X*, from the pedestal faces on each side.

Check the distance from each block center to the center of the truck pivot ball seat with tram No. 1 as shown. These distances should be equal on both sides. If not, the straight edge should be lined out from the near pedestal face until the distances are equal. The amount of adjustment should be so divided between the pedestals that the center line of the axle, when applied to the truck, will be parallel to the line of the adjusted straight edge.

To check the centering device, set the two rockers on their seats on the truck frame and mark the center of each rocker. Check the distance between the rocker centers *W* which should equal the distance between the rocker plates on the rear-end cradle of the locomotive frame. Check distance *R* from the truck pivot center to the rocker centers with tram No. 2 as shown, and scribe the arc on the rocker. These distances should be equal on both sides and should equal the distance from the pivot center of the rocker plates on the locomotive frame. Check the distance from the block centers on the straight edge to the rocker centers with tram No. 3 as shown and scribe the arc on the rocker. These distances should also be equal on both sides.

The arcs scribed by trams No. 2 and 3 should intersect at the rocker centers. If they do not the centering device should be shifted on the truck frame until properly adjusted. Also, the contour of the rockers should be checked with a suitable gage to insure maintenance and correct the lateral resistance of the truck.

The method of checking the alignment of a four-wheel Delta-type trailer truck is shown in Fig. 11. It is practically the same as the method described for the two-wheel truck, except that a second straight edge, with adjustable center blocks, is applied at the second pair of pedestals. The rocker locations are checked from the pivot-pin center and the block centers on the straight edge through the back pedestals.

Final Check

After the driving wheels are applied, wedges set up and pedestal binders applied and tightened, the locomo-

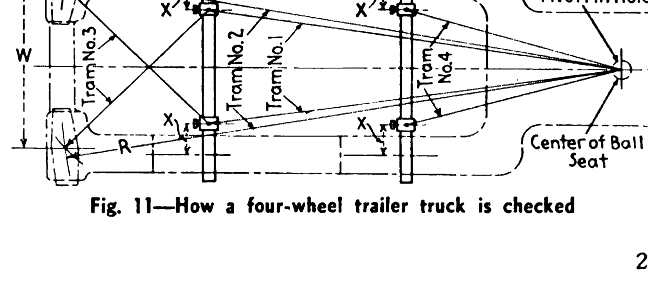


Fig. 11—How a four-wheel trailer truck is checked

tive should be trammed for correct distance between the driver-axle centers on both sides. Also, measure the distance from the inside face of the tire to the outside face of the frame ahead of and back of the axle on each wheel. For individual wheels, these distances ahead of and behind the axle should be equal.

This final check indicates that the axles are in proper alignment with the frames, that the wheel centers are in proper alignment with the axles and that the tires are in proper alignment with the wheel centers.

Conclusion

The method of checking the alignment of the main frames, driving wheels, engine and trailer trucks and laying off shoes and wedges, described herein, was developed to meet the requirements of modern locomotive design and present day backshop practice. It is applicable to all types and classes of modern steam locomotives, with slight modifications in certain cases.

The primary base, from which all checking is done, is the *mean* center line of the main frames. The reason for this is that modern heavy frames and bed castings seldom get out of alignment and when they do are difficult to correct, except in the larger shops where ample facilities are available. It is usually easier to compensate for slight cases of misalignment by adjustment of parts other than the frames themselves, such as the thickness of driving-box hub liners, the alignment of cylinder bores, the truing of pedestal jaw faces, etc. Unusual cases of misalignment must, of course, be corrected before permanently satisfactory results can be obtained.

The report was signed by N. M. Trapnell (chairman), assistant superintendent of motive power, C. & O.; J. H. Armstrong, shop superintendent, A. T. & S. F.; A. H. Malenka, shop superintendent, Gr. Nor.; M. D. Chase, shop superintendent, M-K-T; L. D. Richards, superintendent of shops, C. R. I. & P.; R. R. Royal, shop superintendent, I. C., and S. D. Foster, superintendent of locomotive shops, N. Y. C.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Identification of Scale in Boilers

Q.—What are the different types of scale that form in a locomotive boiler? How can they be identified?—M. E. K.

A.—There are three general types of scale; carbonate, sulphate and silicate. The scale is generally composed of more than one of these materials but is classed under the heading of the material which predominates.

Carbonate scale is usually granular and sometimes of a very porous nature. The crystals of calcium carbonate are large but usually are matted together with finely divided particles of other materials so that the scale looks dense and uniform. A carbonate scale can easily be identified by dropping it in an acid solution. Bubbles of carbon dioxide will effervesce from the scale so formed.

Sulphate scale is much harder and denser than a carbonate scale because the crystals of sulphate are smaller and cement together tighter. Sulphate scale is brittle and does not pulverize as easily as the carbonate scale. Also the sulphate scale does not effervesce in acid but will dissolve in hot acid.

Silica scale is the hardest type of scale, resembling porcelain. The crystals of silica are extremely small, forming a very dense and impervious scale. This scale is extremely brittle and very difficult to pulverize. It is not soluble in acid and is usually very light colored.

Maximum Stress Causing Permanent Deformation

Q.—What is meant by the limiting creep stress as applied to boiler steel; should limiting creep strength be included in specifications for flange and firebox steel used in locomotive boilers? —M. K. T.

A.—When steel is subjected to stress it is strained or deformed. If the stress is applied at normal temperature and does not exceed the elastic limit of the steel, the strain is proportional to the applied stress and is taken independent of the time required to apply the stress to the steel. When the stress is removed the steel returns to its original size. At high temperatures it is found that relatively low stresses will result in deformation of the steel that increases with the length of time the stress is applied. This condition has been termed creep and may be defined as the permanent elongation of steel which occurs when the metal is subjected to a stress, the elongation increasing with the length of time the steel is stressed.

The ability of a metal to withstand creep is designated as limiting creep stress. It is usually expressed as the maximum stress which will cause a permanent deformation not exceeding a given amount in a specified number of hours at a definite temperature. It is expressed as the stress which will cause a permanent elongation of not more than one per cent in 10,000 hours at a given temperature, and in the design of some equipment, as one per cent in 100,000 hours at a given temperature.

As a general practice limiting creep strength of steel is only considered for boilers operating at high temperatures and would not be included in the specifications of flange or firebox steel used in locomotive boilers.

Advantages of Cold-Drawn Seamless Boiler Tubes?

Q.—What are the advantages of using cold-drawn seamless-steel tubes over hot-rolled seamless-steel tubes in a locomotive boiler?—F. I. B.

A.—There is no particular advantage in using cold-drawn seamless steel tubes in a locomotive boiler except, perhaps, where weight is involved; with modern power the question of the weight of the locomotive is an important factor in determining what materials are to be used in its construction.

The cold-drawn seamless-steel tubes have a closer dimensional tolerance than the hot rolled tubes and for this reason a more uniform weight can be obtained. Most specifications for boiler tubes provide for a three-gage-plus tolerance for hot-rolled tubes and a two-gage tolerance for cold-drawn tubes. A modern locomotive boiler having 185 3½-in. tubes and 60 2½-in. tubes 19 ft. long would show a difference in weight of approximately 2,000 lb. due to a difference of one gage in the thickness of its tubes.

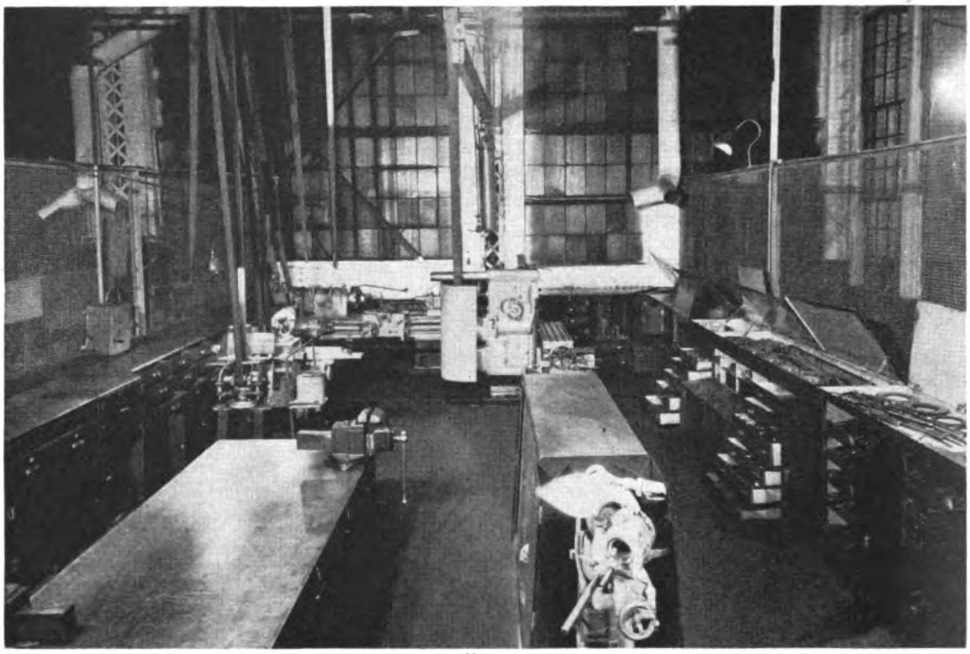
The cold drawing of tubes was adopted primarily to permit the production of smaller diameters, thinner-wall

tubes of great length, better surfaces and closer dimensional tolerances than could be produced by hot processes.

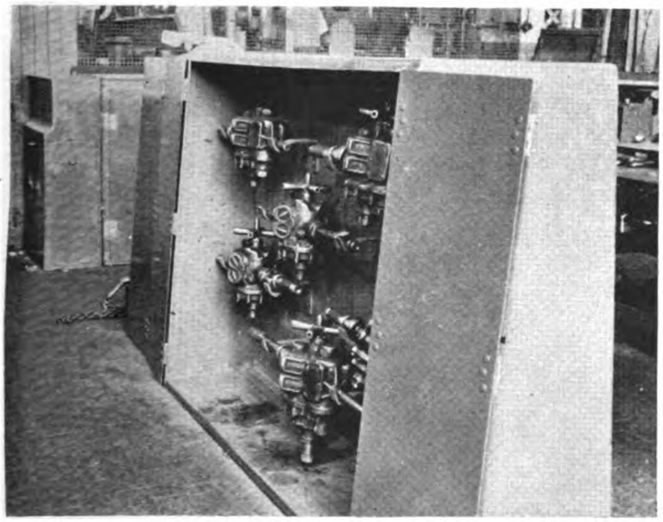
Tool Storage in Metal Cabinets

The accompanying photograph illustrates what may be accomplished in tool storage by the construction of a few well-planned steel cabinets so designed as to take care of all tools in an orderly manner. This rearrangement was recently made in the toolroom at the Nickel Plate Road's locomotive shop at Conneaut, Ohio.

Steel cabinets with polished tops, with conveniently arranged shelves, drawers and compartments have now replaced wooden cupboards and open racks. These cabinets are arranged so that the tops are of uniform height, 43 in. above the floor, and are located around the sides of the toolroom with a pneumatic drill cabinet in the center. The effect not only presents a neat appearance but, by utilizing all available cabinet room and eliminating an estimated 50 per cent waste space, ample storage has been provided with a 25 per cent reduction in floor area.



Steel cabinets with ample drawer space permits tool storage in 25 per cent less floor space



Metal cabinet for the storage of air motors

While a similar exterior design has been followed the interior arrangement of these cabinets has been carefully planned to meet every requirement as conveniently as possible. Heavy tools used on the toolroom milling machine are stored in the top compartments, with hinged covers, near the machine and are easily handled with a small crane. In like manner other heavy tools have been made accessible with a minimum of effort.

Milling cutters are kept in a compartment equipped with a ball-bearing cylindrical revolving rack. Smaller tools such as drills, taps, dies, etc., are kept in drawers containing compartments adapted to each particular size and shape. Each drawer and compartment being definitely marked with metal name plates with raised letters denoting its contents so that no difficulty is encountered in selecting tools.

Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Removing Bull Ring Rivets Without Burning Your Hands

Q.—What is the best method of removing piston bull ring rivets? I seem to have a great deal of trouble, as the carbon deposit on the head of the rivets and around the bull ring will not permit easy burning and heat from the burning carbon scorches my knuckles.

A.—This operation can be accomplished without discomfort. When the piston is located to suit the operator, place a scrap piece of sheet iron on the floor under the bull ring to keep the slag off the floor. Fix a piercing nozzle in the cutting torch and place an 8-in. square of asbestos paper over the handle of the torch. Arrange

a seat within easy reaching distance of the piston and start cutting on the bottom rivet and work up both ways. The piercing nozzle will remove the carbon and heat the head of the rivet sufficiently to start burning. When the high pressure is applied, the torch is moved first to one side and then the other this will completely remove the head of the rivet. This operation should be completed in a maximum of 10 minutes.

Pipe Manifold For Two Torch Sets

Q.—When repairing units and other work requiring the constant use of both cutting and welding torches, I am in the habit of hooking up two complete outfits. This is often impossible, and it becomes necessary to change the torches each time one or the other is needed. Do you know of a way to avoid this changing of torches?

A.—The material required to do this is a pair of short lengths of ⅜-in. standard pipe. A female hose fitting is

Manifold for connecting welding hose

brazed into a hole in the center of the pipe (the hole can be drilled or burned). On each end a male oxygen hose fitting is brazed; the fittings can be sawed off short to make a neater job. The other short length of pipe is treated in the same manner except that acetylene hose fittings are used.

Two short lengths of acetylene hose and two corresponding lengths of oxygen hose are fitted with the regular connections. The 50-ft. length of hose is fastened to the tanks or shop outlet. The adapters are applied to the end of the 50-ft. hose and the short lengths fastened to the adapters. The cutting torch is connected to one short length and the welding torch to the other, thus making it possible to use both torches from the same outlet.

How to Apply Stellite To Equipment Parts

Q.—I am requested occasionally to apply Stellite to parts of railroad equipment. Will you please explain the proper procedure?

A.—To apply Stellite successfully, the work must be spotlessly clean. By this is meant that the surface to be coated must be bright. A slight feather of acetylene is used, the feather should be about ¾ in. long. The part to be hard surfaced is heated with the carbonizing flame until it begins to turn red. At this point the Stellite rod is placed near the flame and it is heated red. The part and the rod are now heated simultaneously and when the part shows a sweat the red hot rod is melted onto the sweating spot. If the part is in the proper condition the drop will spread like bronze or solder tinning on a bright surface. This procedure is carried out until the entire surface to be coated is covered. Increasing the thickness of the deposit is similar to any steel welding. If both sides of the object are to be hard surfaced, the oxide resulting from heating the first side will have to be removed before the second side can be hard surfaced.

Welded Bends in Pipes of Large Diameter

Q.—We are desirous of fabricating large booster and feed-water heater piping by welding in order to eliminate the large radii necessary to bend these pipes. We would appreciate your recommendations as to the proper method of making welded bends in pipes of 3-, 3½-, 4- and 4½-in. diameter.

A.—In welding pipe bends in pipes of these diameters, the edges of the pipes at the joint to be welded should be bevelled to give a vee of from 60 to 70 deg. wherever possible. The pipes should be gapped at the joint from $\frac{1}{16}$ in. to ⅛ in. and the joint should be tack welded at intervals around the pipe so that when welding, the space between the pipes will not contract and close. The tack welds should be made at sufficient intervals so the gap in the joint is not less than $\frac{1}{16}$ in. at any time during the welding.

When the welding metal used has the same tensile strength as the metal in the pipe, a minimum of 10 per cent reinforcement of the weld is necessary. When the weld metal has a lower tensile strength than that of the pipe, sufficient reinforcement of the weld is necessary to insure a joint as strong as the pipe. A 25 per cent reinforcement is the usual practice. Figs. 1 to 4 illustrate typical welded joints for various angles used in fabricating welded bends.

(*Continued on next left-hand page*)

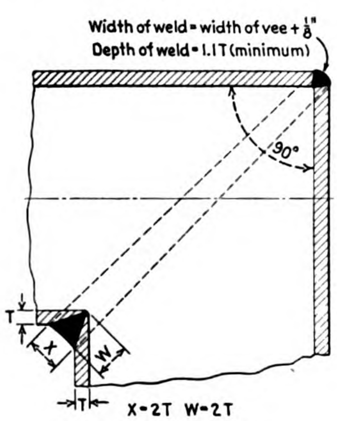


Fig. 1

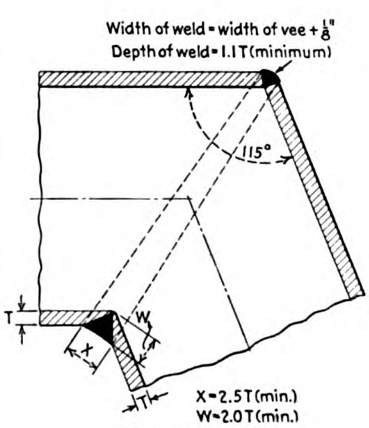


Fig. 2

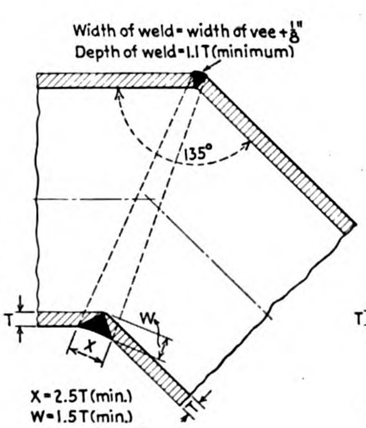


Fig. 3

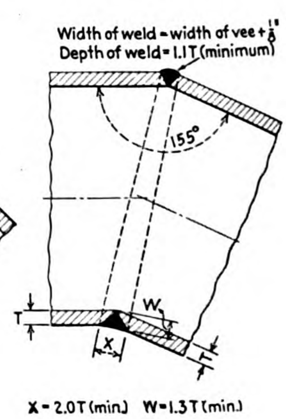
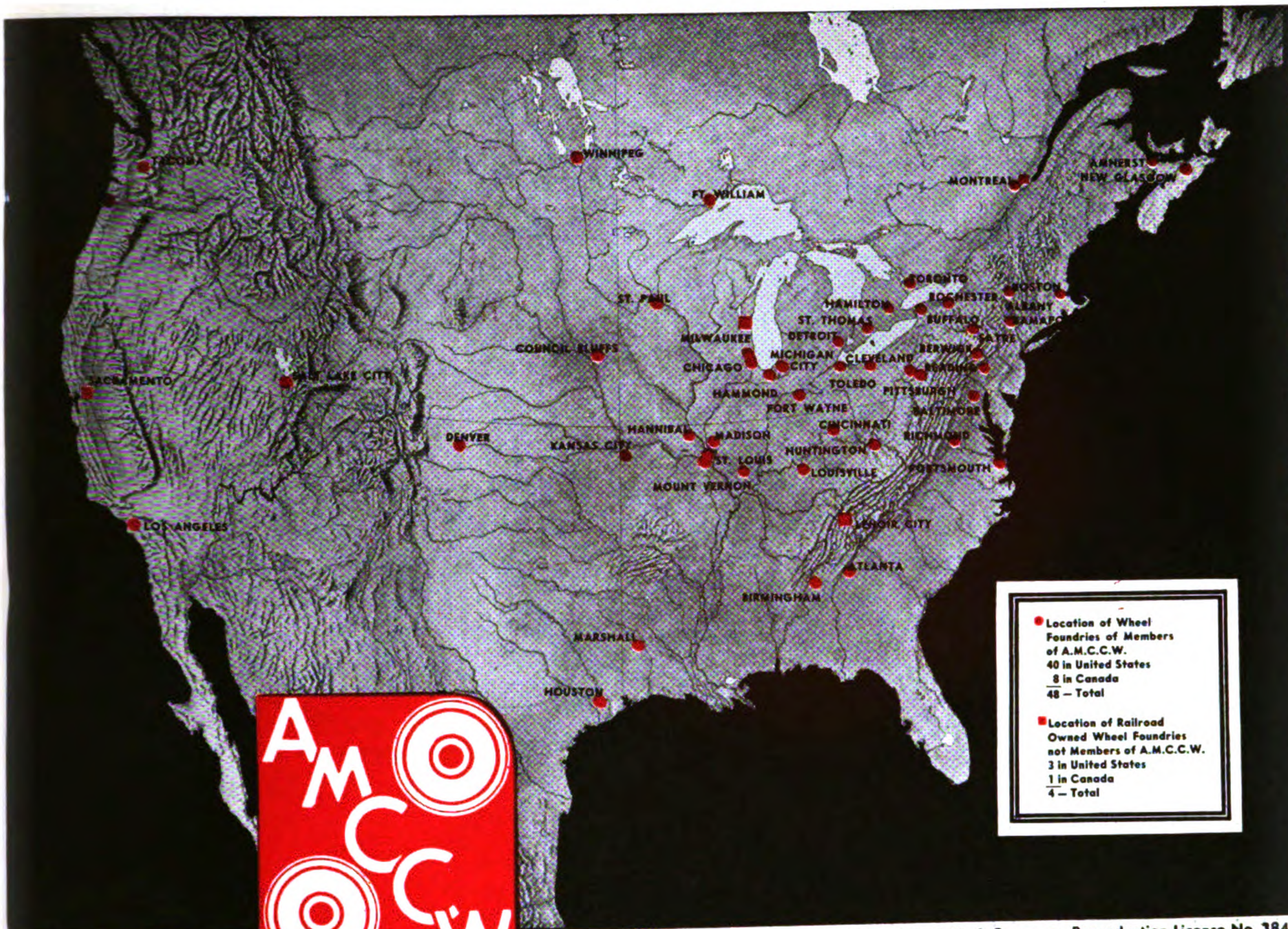


Fig. 4



STRATEGICALLY LOCATED to Serve all RAILROADS

CHILLED CAR WHEEL PLANTS, distributed along the lines of trunk line railways, provide quick and efficient service, reduced delivery charges and a uniform market for scrap wheels, regardless of location.

Spot your shops on the map and you will find a Chilled Car Wheel plant in easy commuting distance. It will be to your advantage to call this manufacturer on your requirements.

The membership of this association includes every manufacturer of Chilled Car Wheels in North America excepting railroad plants.

Albany Car Wheel Company
American Car & Foundry Company
Bass Foundry & Machine Company
Canada Iron Foundries, Limited
Canadian Car & Foundry Company
Cleveland Production Company
Dominion Wheel & Foundries, Limited
Griffin Wheel Company
Hannibal Car Wheel & Foundry Company
Louisville Car Wheel & Railway Supply Company
Marshall Car Wheel & Foundry Company
Maryland Car Wheel Company
Mt. Vernon Car Manufacturing Company
New York Car Wheel Company
Pullman-Standard Car Manufacturing Company
Ramapo Foundry & Wheel Works
Reading Car Wheel Company
Southern Wheel Division of A.B.S. & F. Company
Tredegar Iron Works

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

230 PARK AVENUE,
NEW YORK, N. Y.

445 N. SACRAMENTO BLVD.,
CHICAGO, ILL.

ORGANIZED TO ACHIEVE:
Uniform Specifications
Uniform Inspection
Uniform Product

Repairing Worn Spot in High-Pressure Steam Line

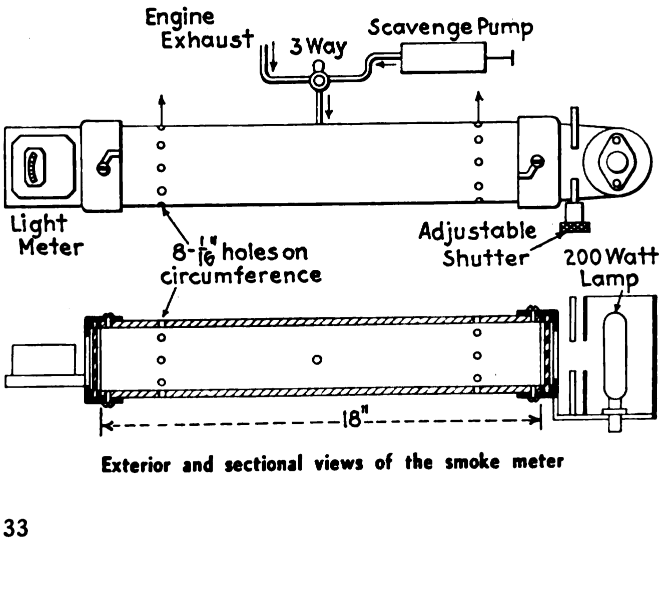
Q.—Several times in the past, I have been called upon to weld tiny holes in the bottom of the high-pressure steam line. These holes are spots worn or rusted thin. When I attempted to weld them with the torch, the flame burned a hole through the thin metal and before I can close it, the opening is sometimes two or three inches long. This makes a difficult welding job. Is there an easier way?

A.—When a pipe line begins to develop leaks due to rusting and pitting on the inside it is a good plan to remove the entire section of pipe. However, if an emergency repair must be made, sound the worn section with a peen hammer to find the area of the worn section—usually it is about 3 in. Make a narrow patch of ⅛-in. plate, bend it to fit the radius of the pipe and tack it in place over the leak in the pipe. Heat the patch and lay it up tight to the pipe. Weld all around with the torch and steel rod. In this manner, burning through the pipe is avoided, making a neat emergency repair.

Meter for Determining Density of Exhaust Smoke

There is no more dependable indicator of the quality of combustion in a Diesel engine than the exhaust smoke. A clear exhaust is evidence of clean combustion, while a dark exhaust is proof of imperfect combustion. When the exhaust is smoky, high fuel consumption and troubles from soot deposits can be predicted with practical certainty. However, exhaust observations are usually made with the free eye, which gives inaccurate results during day time and practically none at night. The exhaust smoke can be judged best with a background of blue sky, but even then the quantity of the exhaust, the observation distance, and the personal element prevent a strict comparison of the observations. On a cloudy day, or in the absence of the sky background, visual observations are less trustworthy, and at night impracticable.

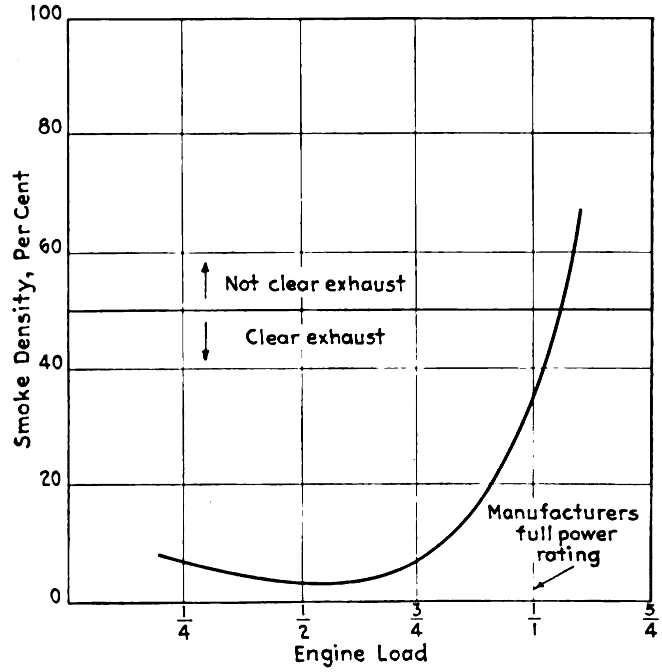
A simple smoke meter has been developed in the Diesel laboratory of Pennsylvania State College and used there as well as by numerous other laboratories with satisfactory results. It consists of a tube about 1¾ in. inside diameter, and 18 in. long, with a glass window at each end. A 200-watt projection lamp is mounted on one end and a shutter with an adjustable diaphragm is interposed between the lamp and the window. A rheostat instead of the shutter may be used to regulate the light intensity by changing the voltage. On the other end of the tube a General Electric pocket-type light meter of the type generally used for measuring room illumination, is mounted.



Exterior and sectional views of the smoke meter

The exhaust is led to the center of the smoke meter tube through a ¼ in. inside diameter copper tubing. The smoke meter tube is open to the atmosphere through two rows of 1/16 in. holes on both ends, 2 in. from the windows. It is advisable to hinge both windows, or make them easily demountable, to facilitate cleaning.

The smoke density is measured in the following way: The tube is scavenged with air, and the light meter hand is brought to register 50-ft. candles by adjusting the shutter (or rheostat). Then the smoke meter is connected to the engine exhaust, and when the hand assumes its new equilibrium in about 30 sec., the foot-candle reading is recorded. If the reading is, say 30 foot-candles, the loss in light intensity is $20/50 = 40$ per cent, and the corresponding smoke density is denoted 40. If the instrument registers no loss in light intensity when switching from free air to engine exhaust, then the smoke density is, of course, zero.



Typical engine smoke-density record

Besides its simplicity there are other points in its favor. The results are independent of the light source intensity, light meter sensitivity, deposits on the windows, exhaust-gas velocity, cross-sectional area of the smoke meter tube and the point of location for the connecting tube on the exhaust manifold. The only factor that enters—besides the smoke density—is the length of the tube, which can be conveniently standardized at 18 in. If the windows become obscured during the test, or the light source changes in intensity, etc., the effect is neutralized by so adjusting the shutter that the light meter hand registers 50 with free air. If the exhaust smoke causes the hand to go back to x then the smoke density is $100\ (1—x/50)$ per cent.

The accompanying chart shows a typical smoke-density record of an engine. It will be noted that between ¼ and ¾ load the smoke density is practically zero. Beyond the ¾-load point the smoke density increases slowly, while beyond the normal full load it increases rapidly. Against blue sky background the smoke is just beginning to be clearly visible when the smoke meter registers a smoke density of 50.

High Spots in

Railway Affairs . . .

Mexican Railroads Making Headway

The National Railways of Mexico experimented for two years under the Workers' Administration. Things went from bad to worse; expenses got out of control; employee morale declined, and serious accidents took place because of the lack of discipline. Finally, a year ago, the Workers' Administration of the Railways was abolished by a decree of President Camacho, and on January 7, 1941, a law was made effective by which the government assumed responsibility for the operation of the railways. A new management was placed in charge. Firmly, but without disturbance, discipline was restored and a drastic control of expenditures was inaugurated. The effect of these measures was reflected in the 1941 operations and promises to be still more pronounced in 1942. General Estrada, the general manager, reported to the Senate early last year that during the Workers' Administration an "unbalanced generosity" had existed in the recognition of labor demands and in granting privileges and concessions beyond the financial power of the railroads. His objective was to operate them on a strictly commercial and sound economic basis, attempting to keep the expenses well within the limit of 85 per cent of the earnings, and holding the payroll down to not more than 48 per cent of the total expenses.

Rate Increase Hearings

The granting of the wage increases to railroad employees makes necessary a readjustment of freight and passenger rates. The necessity for this was recognized by the emergency board which functioned under the provisions of the Railway Labor Act. The railroads on December 13 filed a petition seeking an increase of 10 per cent in all passenger fares, except in the 1¼ cents per mile rate allowed members of the military or naval forces traveling on furlough. No increase was requested in the extra fares charged on extra fare trains. An increase of 10 per cent was requested for all freight rates, except for anthracite and bituminous coal, coke and iron ore, for which special adjustments were requested. The new rates should be established as promptly as possible; to this end the Interstate Commerce Commission started to hold hearings at St. Louis, Mo., on January 5. Oral arguments before the entire Commission will follow immediately after the hearings are completed. The Railway Express Agency hearings will begin on January 9 and will follow through along with the railroad case. It is a most unusual circumstance for the entire Commission to sit on a hearing outside of Washington. It is anticipated that the hearings will be completed within a week or two.

Retirement Board Moving to Chicago

Washington, badly overcrowded by the national defense activities, must still further increase the federal personnel with our entry into the World War. Some headway could be made in eliminating congestion if non-essential, non-defense activities and bureaus were cut down and dispensed with. Congress and the Administration, however, seem unwilling to take such a common-sense and practical step. Patronage and the pork barrel still prevail, in spite of the desperate straits into which the taxpayer is being forced. To make room for the increased war activities, 12 federal bureaus have been ordered out of Washington by President Roosevelt. Among the "first batch" to go is the Railroad Retirement Board, with its 1,600 employees. The board has been handicapped by the fact that its 222,000 sq. ft. of office space in Washington has been scattered among eight buildings. It had looked forward to the time when its work would be consolidated in the so-called Railroad Retirement Board Building. That, however, was taken over by defense agencies and the Retirement Board has no space in it. Chairman Latimer is trying to arrange for office space in Chicago, to which place the work of the bureau is to be transferred.

Director of Transportation

Even under normal conditions there has been a growing recognition in this country of the advisability of co-ordinating the various forms of transportation in such a way as to insure adequate transportation to all of our people and at the lowest possible unit cost. True, we have not made much progress in that respect, and yet there has been a steady trend in the right direction. It is vital in a national emergency, such as the one that now confronts us, that all of the common carriers work intelligently and closely, to the end that the transmission of necessary freight and passenger traffic be facilitated as much as possible and without needless waste of effort or energy. President Roosevelt has appointed Joseph B. Eastman, chairman of the Interstate Commerce Commission and former federal co-ordinator of transportation, to the newly created position of Director of Defense Transportation. Apparently Mr. Eastman will become, in effect at least, a member of the President's Cabinet, and as a representative of the Commander-in-Chief, will take such steps as may be necessary "to assure maximum utilization of the domestic transportation facilities of the nation for the successful prosecution of the war."

Mr. Eastman And the Railroads

The railroads made a splendid record last year, in spite of the heavy movement of traffic caused by the World War and our national defense program. There is no indication that they will not be able to meet the demands that may be made upon them during this year and next year, if they are permitted to add a reasonable number of new cars and locomotives and secure material for the necessary repairs. The appointment of Mr. Eastman as Director of Defense Transportation, therefore, bears no relationship to the breakdown of the railroads during the first World War and the appointment of a Director General of the Railroads. In other words, the government is not taking over the operation of the railroads; moreover, Mr. Eastman's jurisdiction extends over all forms of transportation and is not restricted to the railroads. In a broad way, there are many things that he can do under emergency provisions which will permit, if advisable, a closer co-ordination of all of our present methods of transportation. Likewise, there are possibilities in a closer co-ordination of the transportation policies and activities of the various government departments. Undoubtedly, also, Mr. Eastman will be able to speak with a certain tone of authority in dealing with those who have charge of material priorities and in seeing that the needs of the railroads, as well as the other types of transportation are provided for. It is quite possible that as a representative of the government he may find it necessary to make recommendations for certain changes in the rates. These may have to take the usual course through the Interstate Commerce Commission, but undoubtedly corners can be cut and prompt action taken if he so recommends. Mr. Eastman's familiarity with transportation problems, because of his long experience on the Interstate Commerce Commission and also his experience as Federal Co-Ordinator of Transportation, fit him admirably for the task which has been assigned to him. He is assured of full support and co-operation on the part of the railroads.

(*Turn to second left-hand page*)

Among the Clubs and Associations

Railway Club of Pittsburgh.—Meeting held December 18, Pittsburgh, Pa. Speaker: John W. Barriger, III, Western Carriers' Conference Committee. Subject: The Railroad Futurama.

New England Railroad Club.—Meeting January 13, Hotel Touraine, Boston, Mass. Dinner, 6:30 p. m. Speaker: Prof. Kent T. Healy, Yale University. Subject: Railroad Policy of the Present Emergency.

Northwest Locomotive Association.—Meeting held December 15, St. Paul, Minn. Speaker: L. E. Caldwell, Service Educational Director. Subject: Modern Diesel Locomotives. Motion pictures, "Electro-Motive Railway Type Diesel Engines."

Railway Club of Pittsburgh.—Meeting January 15, 8 p. m., Fort Pitt Hotel, Pittsburgh, Pa. Dinner at 6:30 p. m. Speaker: Professor Louis E. Endsley, consulting engineer, Pittsburgh. Subject: The Diesel Electric Locomotive.

Car Department Association of St. Louis.—Meeting January 20, 8 p. m., Hotel DeSoto, St. Louis, Mo. Dinner and social period 6 p. m. Speaker: W. Carl Ketcherside. Subject: Safety—First, Last and Always. Oil firing film of Shell Oil Company.

Eastern Car Foreman's Association.—Meeting held January 9. Speaker: P. J. Hogan, superintendent car inspection and maintenance, New York, New Haven & Hartford. Subject: A. A. R. Rules of Interchange.

Car Foreman's Association of Chicago.—Meeting 8 p. m., January 12, La Salle Hotel, Chicago. Speaker: J. E. Mehan, assistant to superintendent car department, Chicago, Milwaukee, St. Paul & Pacific. Subject: A. A. R. Rules of Interchange.

Northwest Car Men's Association.—Meeting held January 5. Speaker: J. E. Mehan, assistant to superintendent car department, Chicago, Milwaukee, St. Paul & Pacific. Subject: A. A. R. Rules of Interchange.

Car Foremen's Association of Omaha, Council Bluffs, and South Omaha Interchange.—Meeting January 27, 8 p. m,. Castle Hotel, Omaha, Neb. Speakers: F. E. Cheshire, president, and G. R. Anderson, vice-president, Car Department Officers Association. Subject: Changes in A. A. R. Rules and Problems of Transportation in War.

St. Louis Car Men Hold Live Annual Meeting

At the annual meeting of the Car Department Association of St. Louis, held Tuesday evening, December 16, at the Hotel DeSoto, St. Louis, Mo., the following were elected officers for the ensuing year: President, A. R. Holloway, passenger car foreman, Pennsylvania, St. Louis, Mo.; first vice-president, G. R. Phillips, superintendent, St. Louis & O'Fallon, East St. Louis, Mo.; second vice-president, L. W. Martin, general car foreman, Terminal Railroad Association of St. Louis; third vice-president, R. G. Setzekorn, mechanical superintendent, American Refrigerator Transit Company, St. Louis. J. J. Sheehan, chief clerk to superintendent car department, Missouri Pacific, was reelected secretary, and J. J. Helle, chief clerk to superintendent, St. Louis Refrigerator Car Company, was re-elected treasurer. ¶President H. C. Argast, superintendent, St. Louis Refrigerator Company, presided at the meeting and after the election of officers introduced E. L. Woodward, western editor, *Railway Mechanical Engineer*, who served as chairman of the Award Committee, and announced the following award of prizes for seven short papers presented at regular monthly meetings throughout the year by car men from the ranks: Twenty-five dollar first prize for the paper "Passenger Car and Coach Yard Sanitation," presented at the September 16 meeting by Neal J. Capaldo, clerk and extra gang foreman, Terminal Railroad; $15 second prize for the paper "Pullman Equipment Maintenance and Periodic Inspection," presented at the March 18 meeting, by W. T. Kidwell, yard foreman, Pullman Company; $10 third prize for the paper "Fire Prevention in Connection with Car Department Work," presented at the February 18 meeting by Edward Sparn, planing mill man, Southern; and $2 each for the following: "The Past and Present-Day Tank Car," presented at the April 15 meeting by C. H. Behen, Socony, Vacuum Oil Company; "The Progress of American Railroads During the Past Ten Years," presented at the January 21 meeting by E. C. Bailey, car man helper, Pennsylvania; "Air-Conditioning Equipment on Passenger Cars," presented at the October 21 meeting, by W. J. Parrott, electrician, Missouri Pacific; "Opportunities Afforded Apprentices in the Car Department," presented at the May 20 meeting, by A. H. Zack, leadman, Illinois Central. ¶Other members of the Award Committee who worked with the chairman in rating the individual short papers included D. J. Sheehan, superintendent motive power, Chicago & Eastern Illinois, and R. G. Setzekorn, American Refrigerator Transit Company, St. Louis. As soon as the award was announced, the Entertainment Committee, under the direction of C. B. Martin, St. Louis Malleable Castings Company, took charge of the meeting and put on an interesting program of entertainment for approximately 400 members and guests who were in attendance.

V. R. Hawthorne Addresses Chicago Car Foremen

At a meeting attended by 500 members and guests on Monday evening, December 8, at the Hotel LaSalle, Chicago, the Car Foremen's Association of Chicago was addressed by V. R. Hawthorne, executive vice-chairman, Association of American Railroads, Mechanical division, on the subject "Keep the Wheels Rolling." Included among those attending were several officers and members of the National Car Department Officers' Association and also a group of 17 representative St. Louis car men, members of the Car Department Association of St. Louis. ¶Mr. Hawthorne emphasized particularly the necessity of greater care in the securing of lading, the prompt and expeditious handling of bad order cars to the repair tracks and avoidance of the shopping of all loaded cars which can be handled safely to destination. In closing his remarks, Mr. Hawthorne said that "the railroads, during the coming months, will be expected to accept and transport the greatest volume of traffic in their history. The size of the railroad plant, roadway, shops, locomotives and cars, will, to a great extent, be limited to what we already have. We should not, however, get the idea that the railroads are operating to capacity. No one knows what the capacity of the railroads is. It depends upon how well the officers and employees do their job. It is, therefore, the obligation of every railroad man to do everything in his power to obtain the utmost utilization of the facilities and equipment now available or which may be acquired in the future. It is up to all railroad men, including you car men, to do the best job possible in order that the business offered may be handled with safety and dispatch. It is up to all of us to 'Keep the Wheels Rolling.'"

NEWS

Pelley Cites 1941 Service Records

"RAILROADS of the United States in 1941 handled, without congestion or car shortage, the greatest volume of freight in their history, and they are confident of their ability to meet transportation demands in 1942 if materials for adequate maintenance and for new construction are made available," said J. J. Pelley, president of the Association of American Railroads in a year-end statement issued December 30.

A part of Mr. Pelley's statement follows:

"Despite unprecedented conditions, and the quickening effect of a growing defense and war production, traffic this year has moved smoothly and without delay. The railroads have performed an operating job of which they can well be proud. Measured in revenue ton-miles, the freight volume transported in 1941 amounted to approximately 470 billion ton-miles. This was an increase of 5.1 per cent above the previous record made in 1929. It also was an increase of 25.9 per cent above 1940. This record traffic took place despite the fact that carloadings of revenue freight were 20 per cent less than in 1929 and was due to a combination of heavier loading per car and longer haul per ton than in previous years. In 1941, freight loadings totaled 42,250,000 cars, an increase of 5,892,000 cars or 16.2 per cent above 1940.

"This volume of freight traffic was handled, however, with an ownership of nearly 600,000 fewer cars, or 26 per cent, than in 1929. It was accomplished because of a continuous improvement in cars, locomotives, and facilities, and in operating methods and efficiency, that started 20 years ago and has kept growing despite the ups and downs of the railroads in more recent years. The result has been that the railroads in 1941 hauled more freight per train than ever before and moved each train over the road nearly 1½ times as fast compared with 20 years ago.

"Although the railroads have handled this year more freight traffic and almost as great a passenger traffic as in 1929, they received for that service nearly a billion dollars less in gross earnings. This has been due to the fact that both freight and passenger rates are now much lower than they were twelve years ago.

"Among the outstanding efficiency records established by the railroads in the past year were the following, based on returns for the first ten months:

"1. Average load of freight per train was 915 tons, a new all-time high and an increase of 40.6 per cent above that for 1921.

"2. Performance per train hour more than doubled, gross ton-miles per freight train hour having increased from 16,555 in 1921 to 34,814 in 1941, while net ton-miles per freight train hour increased from 7,506 in 1921 to 14,977 in 1941.

"3. For each pound of fuel used in freight service in 1941, railroads hauled 9.2 tons of freight and equipment one mile compared with 6.2 tons in 1921.

"4. Average daily movement of locomotives was greater in 1941 than in any preceding year.

"5. Average daily movement of freight cars established a new high record and exceeded 20 years ago by 45 per cent.

"6. Capacity per freight car averaged 50.4 tons, the greatest ever attained and an increase of 18.6 per cent compared with 1921.

"7. Tractive force of locomotives averaged 51,495 lbs., an increase of 39.4 per cent compared with twenty years ago.

"Passenger traffic in 1941 was greater than in any year since 1929, it having amounted to 29 billion passenger miles, an increase of 22.1 per cent above 1940. This increase above last year was due in part to troop movements, the railroads having handled approximately three million troops during the year. The average revenue for carrying a passenger one mile during the past year was the lowest on record, amounting to 1.75 cents compared with 3.09 cents in 1921.

"Railroads in 1941 installed about 80,000 new freight cars and about 600 new locomotives in service. They will enter the new year with approximately 75,000 new freight cars and 600 new locomotives on order with deliveries being constantly made. At the same time, both the number and percentage of freight cars now in need of repairs are less than ever before.

"In order to furnish defense officials with information as to the extent to which car and locomotive building plants will be required to take care of the railroads' needs in the coming year, the rail lines, through the Association of American Railroads, in December resurveyed their equipment needs for the coming year. As a result it has been determined that orders will be placed for the construction, in the year extending from October 1, 1941 to October 1, 1942, including those on order on the previous date 115,000 new freight cars and 974 new locomotives, including steam, electric and Diesel-electric. In the opinion of railroad executives after a careful study of the general situation and railway performance in the past, this will increase their available motive power and car supply sufficiently to enable the rail lines to handle at least a 10 per cent increase in traffic compared with 1941.

"Stimulation in traffic during the past year has improved somewhat the financial position of the railroads. Whether this will continue to be true in the coming years remains uncertain owing to rising costs of operation resulting in part from the recent mediation award by which employees were given an increase in wage rates, together with vacations with pay to certain classes of employees, at a total cost to the railroads of about $331,771,000 annually. The railroads have asked the Interstate Commerce Commission for authority to increase freight and passenger rates. Hearings in the matter are scheduled to begin on January 5, 1942.

"While complete reports are not yet available, Class I railroads in 1941 are expected to have a net railway operating income before fixed charges of approximately $980,000,000, or a return of 3.72 per cent on their property investment. For the first time since 1930, a period of 11

(*Continued on second left-hand page*)

* * *

Paul's Photos

Narrow-gage locomotive, built by Baldwin in 1890, making its last trip over a branch line (now abandoned) of the Colorado & Southern

Set the Pace

WITH THESE FRANKLIN

THE FRANKLIN SYSTEM OF STEAM DISTRIBUTION

For capacity

TO HAUL HEAVY LOADS AT HIGH SPEEDS > > > >

The Franklin System of Steam Distribution makes available 30 to 40% more horsepower for revenue work — without increasing the size of the locomotive. This large increase is accomplished by means of the following features:

1. Separation of valve events, so that admission, cut-off, release and compression are independently controlled.
2. Absolutely fixed valve events at all speeds and all cut-offs.
3. Large inlet and exhaust passages and improved steam flow.
4. Reduced cylinder clearance volume.
5. Reduced weight of moving masses and reduced mechanical friction.

Through the results obtained by the application of The Franklin System of Steam Distribution it is now possible to build smaller locomotives with the same power or the same size locomotives with even greater power.

FRANKLIN RAILWAY SUPPLY

years, this rate of return exceeded three per cent. During the ten intervening years, 1931 to 1940, the rate ranged from a low of 1.24 per cent in 1932 to a high of 2.59 per cent in 1940. In 1940, their net railway operating income was $682,000,000. After fixed charges, the Class I railroads, according to preliminary estimates, will have a net income in 1941 of $485,000,000, compared with $189,000,000 in 1940. Gross revenues in 1941 approximated $5,325,000,000, an increase of 23.9 per cent above 1940, but a decrease of 15.2 per cent below 1929. Operating expenses were approximately $3,660,000,000 in 1941, an increase of 18.5 per cent above the preceding year but a decrease of 18.8 per cent below the 1929 figure.

"Taxes in 1941 were the highest for any year on record, amounting to $550,000,000 or a daily average of $1,507,000. The previous record for taxes was in 1929, when they amounted to $396,700,000. Maintenance expenditures of Class I railroads in 1941 totaled $1,590,000,000 compared with $1,316,000,000 in 1940. Of the total in 1941, expenditures for maintenance of equipment amounted to $990,000,000."

Copper in Locomotives and Cars To Be Eliminated

At least 30 per cent of the copper used in locomotives and cars can be eliminated, according to reports made by manufacturers to a Special Committee on Locomotive and Car Construction of the Mechanical Division of the Association of American Railroads at Chicago on December 29. The meeting followed a similar one on December 16 at which substitutes for copper and for copper-alloy parts in locomotives and cars were discussed as the result of Conservation order No. M-9-c issued by the Priorities division of the OPM.

The Special Committee of the Mechanical Division will consolidate the reports of the manufacturers and submit the consolidation and its own recommendations to the OPM. It is expected that the OPM will later issue specific instructions as to the use of copper in locomotives and cars.

Steel Priorities Extended to December 31, 1942

General preference orders affecting pig iron, steel, steel warehouses, and special kinds of iron and steel have been extended to December 31, 1942, by the Acting Director of Priorities. All of these had been scheduled to expire November 30, 1941.

Most important of these orders, it is pointed out, is General Preference Order M-21, which puts steel under priority control. General Preference Orders M-17, M-21-a and M-21-b, which are also extended, cover pig iron, alloy steels, and steel warehouses. The orders also apply to inventories of any of these materials.

Another order also extended is Preference Rating Order No. P-31, which assigns limited blanket ratings of A-1-b and A-1-c to orders for certain materials essential to the operations of manufacturers of foundry equipment and repair parts. This order was extended to May 30, 1942.

Complete Allocation of Steel Plates

Complete allocation of steel plates was ordered on December 1 by Donald M. Nelson, director of priorities, Office of Production Management, in General Allocation Order No. 1. The action is the first step in compliance with the request of the Supply, Priorities and Allocations Board, made November 1, that a direct allocation system for steel be worked out.

Defense demands for steel plates are such that the Army, Navy and Maritime Commission take approximately 50 per cent of existing capacity. Other "leading users" listed in the OPM announcement are the railroads, for car construction, and the petroleum industry, for pipe and in the construction of all types of tanks.

As of November 1, reports from steel plate producers showed defense and essential civilian orders, with ratings of A-10 or higher, in excess of production capacity for shipment during the month. Capacity of the industry is about 600,000 tons a month. The order effective December 1, 1941, defines plates and provides that no person shall produce, deliver or accept plates except in accordance with the orders issued by the director of priorities.

Producers are required to file with OPM's Iron and Steel Branch, by the 15th of each month a schedule of production and shipments for the following month, together with a statement of unfilled orders for the period. They then will receive an allocation order from the director of priorities, making any changes that are deemed advisable. Plates produced in excess of schedule cannot be disposed of except at the direction of the director of priorities.

The order also provides that suitable forms for producers and customers will be prescribed from time to time. Immediate purpose of the order, according to OPM, is to insure "a continuous flow of plates into defense channels and to provide an adequate check against hoarding and excessive inventories."

Studies of steel plate requirements for non-defense industries now are being made by the Division of Civilian Supply in conjunction with the Division of Materials to determine what proportion of the available supply should be allocated to each. No direct allocations of this kind have yet been made, although substantial steps in this direction are being taken. Steel has been

(Continued on next left-hand page)

Orders and Inquiries for New Equipment Placed Since the Closing of the December Issue

Locomotive Orders

Road	No. of Locos.	Type of Locos.	Builder
Akron & Barberton Belt	1	660-hp. Diesel-elec.	Baldwin Loco. Wks.
Akron, Canton & Youngstown	1	1,000-hp. Diesel-elec.	American Loco. Co.
Alton	1	4.000-hp. Diesel-elec.	Electro-Motive Corp.
Belt Railway of Chicago	2	1,000-hp. Diesel-elec.	American Loco. Co.
	2	1,000-hp. Diesel-elec.	Electro-Motive Corp.
Bessemer & Lake Erie	2	2-10-4	Baldwin Loco. Wks.
	2	0-8-0	American Loco. Co.
Bingham & Garfield	1	1,500-hp. Diesel-elec.	General Electric Co.
	1	1,000-hp. Diesel-elec.	American Loco. Co.
Brecon Loading Corp.	1	Diesel-elec.	General Electric Co.
Canadian Pacific	17	4-6-2	Canadian Loco. Co.
Carnegie-Illinois Steel Corp.	4	400-hp. Diesel-elec.	General Electric Co.
Chicago & North Western	8	1,000-hp. Diesel-elec.	American Loco. Co.
	12	660-hp. Diesel-elec.	Electro-Motive Corp.
Chicago, Indianapolis & Louisville	3	1,000-hp. Diesel-elec.	Electro-Motive Corp.
	1	600-hp. Desel-elec.	
F. C. Del Estado Villazon-Atocha (Bolivia)	4	2-10-2	Baldwin Loco. Wks.
Iran Government	24	190-hp. Diesel-mech.	Davenport Besler Corp.
Kansas City Terminal	4	660-hp. Diesel-elec.	American Loco. Co.
National Rwys. of Mexico	11	4-8-4	Baldwin Loco. Wks.
	6	2-8-0	
	9	4-8-4	American Loco. Wks .
	7	2-6-6-2	
New Orleans & Northeastern	4	2,700-hp. Diesel-elec.	Electro-Motive Corp.
New York, Chicago & St. Louis	6	Diesel-elec.	American Loco. Co.
	4	Diesel-elec.	Electro-Motive Corp.
Northeast Oklahoma	1	500-hp. Diesel elec.	General Electric Co.
Northern Pacific	2	1,000-hp. Diesel elec.	American Loco. Co.
Ravenna Ordnance Plant	2	Diesel-elec.	General Electric Co.
Tennessee Central	1	660-hp. Diesel-elec.	American Loco. Co.
Tennessee Coal, Iron & R. R. Co.	4	660-hp. Diesel-elec.	American Loco. Co.
Terminal R. R. Association of St. Louis	2	1,000-hp. Diesel-elec.	Electro-Motive Corp.
	2	1,000-hp. Diesel-elec.	American Loco. Co.
	1	1,000-hp. Diesel-elec.	Baldwin Loco. Wks.
U. S. Navy Dept., Bureau of Supplies and Accounts	5	Diesel-elec.	General Electric Co.
	2	Diesel-elec.	H. K. Porter Co.
	1	Diesel-elec.	Whitcomb Loco. Co.
	1	Diesel-elec.	Fate-Post-Heath Co.
U. S. War Dept.	70[1]	2-8-2	Lima Loco. Wks.
	70[1]	2-8-2	Baldwin Loco. Wks.
	60[1]	2-8-2	American Loco. Co.
	1	Diesel-elec.	H. K. Porter Co.
	1	Diesel-elec.	General Electric Co.
		....	Vulcan Iron Works[2]

Locomotive Inquiries

Road	No. of Locos.	Type of Locos.	Builder
U. S. Navy Dept.	1	45-ton Diesel-elec.	....
	1	50-ton Diesel-elec.	....
	1-2	35-ton Diesel-elec.	....
Wabash	3	Diesel-elec.	....

(Continued on next left-hand page)

Freight-Car Orders

Road	No. of Cars	Type of Cars	Builder
Aliquippa & Southern	50[3]	100-ton gondola	Company shops
Aluminum Co. of America	3	40-ton refrigerator	Company shops
Burlington Refrigerator Express Co.	300[3]	70-ton hopper	Gen. Amer. Transp. Corp.
Birmingham Southern	10	90-ton transfer	American Car & Fdry. Co.
Chicago & North Western	250	70-ton ore	Bethlehem Steel Co.
Chicago, Indianapolis & Louisville	10	70-ton hopper-cement	Gen. Amer. Transp. Corp.
Elgin, Joliet & Eastern	500	50-ton gondola	Gen. Amer. Transp. Corp.
	500	50-ton gondola	American Car & Fdry. Co.
	200	50-ton flat	Ralston Steel Car Co.
Great Northern	1,000	50-ton box	Company shops
Inland Steel Co.	15	90-ton stake	Gen. Amer. Transp. Corp.
Monongahela Connecting	35[2]	120-ton gondola	Company shops
New York, Chicago & St. Louis	25	70-ton hopper	American Car & Fdry. Co.
Niagara Alkali Co.	10[2]	40-ton tank	American Car & Fdry. Co.
Norfolk & Western	25	70-ton hopper	Company shops
Tennessee Coal, Iron & R. R. Co.	10	70-ton ore	Company shops
U. S. Navy Dept.	10	20-ton flat	Pacific Car & Fdry. Co.
	10	40-ton box	Gen. Amer. Transp. Corp.
	12	40-ton flat	Haffner-Thrall Car Co.
U. S. War Dept.	75[1]	20-ton flat	Magor Car Corp.
	40[1]	30-ton flat	
	75[1]	20-ton gondola	
	40[1]	30-ton gondola	
U. S. Treasury Dept.	2,400[1]	Flat	Pressed Steel Car Co.
Virginian	900	55-ton hopper	Company shops
	100	55-ton gondola	
Warren Petroleum Corp.	20	50-ton tank	American Car & Fdry. Co.
Weirton Steel Co.	18	50-ton flat	Company shops
Freight-Car Inquiries			
Colorado Fuel & Iron Co.	50	70-ton gondola	
Louisville & Nashville	1,000	Box	
	2,100	Hopper	
	150	Flat	
U. S. Navy Dept., Bureau of Supplies and Accounts	10	50-ton gondola	
U. S. War Dept.	2,000[1]	40-ton box	
	1,500[1]	40-ton gondola	
	350[1]	50-ton flat	
	1,000[1]	20-ton box	
	66[1]	20-ton caboose	

Passenger-Car Orders

Road	No. of Cars	Type of Car	Builder
Nashville, Chattanooga & St. Louis	1	Coach	Edw. G. Budd Mfg. Co.
Passenger-Car Inquiries			
National Rwys. of Mexico	2	Business	
United States War Dept., Engineering Corps	3[4]	Baggage	
	16[4]	Coach	
	2[4]	Dining	
	5[4]	Sleeping	
	3[4]	Mail	
	4[4]	Express	
	1	Coach	
	1	Passenger-baggage	

[1] For export.
[2] For May, 1942, delivery.
[3] For 1942 delivery.
[4] Narrow-gage.

under priorities control since May 1, 1941, when General Metals Order No. 1 was issued. General Preference Order M-21, issued May 29, has provided overall steel control since.

Equipment Designs Limited

As a measure of conserving metals needed in the interest of national defense, J. J. Pelley, president of the Association of American Railroads, has announced for the railway industry a program which will limit the construction of new locomotives and freight cars to certain designs now in use and facilitate the allocation of steel and other materials to be used for such construction and repair purposes. The major points of the plan to which the railroads are committed with the Office of Production Management are:

1—Construction of new box, hopper, gondola, and flat cars will be limited to certain designs now in use. The proposed designs of freight cars were described in an article on page 512 of the December *Railway Mechanical Engineer*.

2—New locomotive construction will be limited to existing designs where patterns, dies, and engineering data are already available.

3—Substitution of other materials so far as possible for scarce metals in locomotive and freight-car construction.

4—Use of carbon steel rather than alloy steel in locomotive boiler construction.

5—Use of steel plates and steel sheets 48 in. wide in the construction of new freight cars instead of sizes now largely used ranging up to 119 in. in width.

Under the arrangement, car and locomotive builders will interchange plans, engineering data, and patterns which will expedite the building of railroad equipment and increase the capacity of facilities used for that purpose.

Under the agreement the use of nickel steel for locomotive bed castings, axles and rods and other moving parts both for new construction and repairs and for steel plates and rivets for repairs on existing locomotives constructed of nickel steel will continue.

In discussing locomotive needs, Mr. Pelley said: "The defense program now contemplates using facilities of the locomotive builders for production of defense material and, in order that consideration may be given to reserving sufficient capacity to meet requirements of the railroads' 1942 locomotive building program, information is desired covering requirements of each railroad.

"The suggested method contemplates an analysis of each division or district for each kind of power, freight requirements to be determined on the basis of gross ton-miles and tractive force, passenger requirements on basis of scheduled and extra movement, switch requirements on basis of assignments, and company service locomotive requirements on basis of assignments."

The railroads are also requested to inform Mr. Pelley not only as to the number of locomotives now on order, but also as to the number of additional ones which in their opinion will be necessary to meet transportation demands next year on the basis of present indications and present operating methods.

The railroads have also been asked to give attention to the possibilities of obtaining greater utilization of their locomotives by further increasing the length of runs; expediting the servicing at principal and intermediate terminals, reducing layover time so as to insure that none is allowed to stay at terminals longer than necessary; avoiding the sending of locomotives to enginehouses except for necessary repairs; centralizing running repair work, and reducing repair time by having sufficient force on hand at all times to return locomotives to service as expeditiously as possible.

OPM Organization Change

The Office of Production Management's Automotive, Transportation and Farm Equipment Branch, which handles materials for railway equipment and supplies, will hereafter report directly to OPM Director General William Knudsen and Associate Director Sidney Hillman. The branch has been under the direction of Leon Henderson, director of OPM's Division of Civilian Supply.

The change which also affects other industry branches in like manner is designed to "speed up war production." In that connection, the OPM announcement said that Messrs. Knudsen and Hillman "are calling upon all industry branch chiefs to draw more extensively upon the experience and active services of labor and management committees in meeting such problems as the maximum war use of equipment and manpower. . . ."

From the OPM Division of Priorities has come a new order with respect to repair, maintenance and operating supplies. It is known as Preference Rating Order P-100, and it takes the place of the old repair and maintenance order, P-22, which is being revoked. While many of the differences between P-100 and P-22 are technical, the OPM announcement said that some liberalization of the old plan is involved. Railroads remain among the industries eligible under the plan for priority assistance in the matter of obtaining maintenance and repair parts.

Basic Priorities Order Amended

Priorities regulation No. 1, the basic document which governs the operations of the priority system, has been amended in several important respects. It became effective December 23. Most important of the changes is a requirement that *all* orders bearing a priority rating, including B-ratings for essential civilian orders as well as A-ratings for defense orders, must be accepted by producers, in preference to any unrated order. Previously the acceptance of B-rated orders was not mandatory.

(*Continued on next left-hand page*)

The Office of Production Management announcement called the required acceptance of B-rated orders a further transitional step in the move toward allocation of scarce materials, since B ratings are one method of designating the relative importance of civilian uses for materials after war requirements have been met. Treatment which must be given to defense orders is clarified by a new provision which assigns a priority rating of A-10 to all defense orders not otherwise rated. This change is intended to eliminate confusion as to the handling of those defense orders which were previously unrated, in relation to other orders which had been specifically rated A-10, the lowest rating in the A series.

Section 944.14 of Priorities, Regulation No. 1 has been revised to provide a stricter limitation of inventories. Whereas producers were previously forbidden to increase their inventories beyond the amount necessary to meet required deliveries of their products, they are now forbidden to accept delivery of materials for inventory in excess of a practicable working minimum. The prohibition applies to suppliers of materials for inventory as well as to producers who maintain inventories, and it covers non-defense as well as defense producers. An exception is made, however, for inventories of materials imported from foreign countries. Also, there is a provision that no material may be fabricated, processed, alloyed or otherwise altered if the producer's inventory of the material in its altered form would thereby be increased beyond a practicable working minimum, unless specific authorization is granted by the director of priorities.

Another amendment is designed to help prevent receipt of a new, high-rated order from interfering with fulfillment of the delivery date on a previously accepted lower-rated order. Unless the new order bears an AA rating or is accompanied by specific direction from the director of priorities, it will not have to be accepted if its acceptance would necessitate preempting material which has already been completed to fill a previously accepted defense order which bears a lower rating, or if it would preempt material which is within 15 days of completion. Or, if the new order is accepted, the producer may not divert material already completed or about to be completed on a previous defense order for use in filling the new order.

Equipment Purchasing and Modernization Programs

Canadian National.—The Canadian National has authorized the purchase of 415 40½-ft. box cars of 40 tons' capacity.

Chicago & North Western.—The C. & N. W. has requested authority from the Interstate Commerce Commission to assume liability for $3,800,000 of equipment trust certificates, maturing in 10 equal annual installments of $380,000 on January 1 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $5,125,000, and consisting of 1,375 50-ton, 40 ft. 6 in., all-steel box cars, and 250 70-ton steel iron ore cars.

Chicago, Rock Island & Pacific.—The Rock Island has been given permission by the district court to purchase $4,190,000 of equipment, including 12 Diesel-electric switching and 5 Diesel-electric road locomotives, and 850 freight cars.

Missouri Pacific.—The Missouri Pacific has been authorized by the district court to spend $204,000 for the acquisition of 17 parlor cars and their conversion into coaches. The cars will be purchased from the Pullman Company.

New York, New Haven & Hartford.—The New Haven has applied to the Interstate Commerce Commission for authority to assume liability for $2,940,000 of equipment trust certificates, the proceeds of which will finance about 80 per cent of the price of equipment expected to cost a total of $3,675,000. The equipment includes five electric freight locomotives; 10 2,000-hp. Diesel-electric "A" unit passenger and freight locomotives, which will ordinarily be operated in pairs, and 50 steel cabooses. The certificates, to be issued at a rate determined from competitive bids, will be dated February 1, 1942, and will mature in equal annual installments of $294,000 on February 1 of each year from 1943 to 1952, inclusive.

Pennsylvania.—The Pennsylvania has asked authority from the Interstate Commerce Commission to assume liability for $18,465,000 of equipment trust certificates, maturing in equal annual installments of $1,231,000 on January 1 in each of the years from 1943 to 1957, inclusive. The proceeds of the issue will be used as part of the purchase price of new equipment costing a total of $23,081,250. The new equipment, which will be constructed in the company's own shops, will consist of the following: 2,000 all-steel box cars; 2,700 all-steel hopper cars; 500 all-steel, mill-type, G-27 gondola cars; 500 all-steel, mill-type, G-29 gondola cars; 300 all-steel covered hopper cars; 10 all-steel, heavy duty flat cars; 10 all-steel, heavy duty well cars; 50 all-steel cabin cars; 12 steam locomotive tenders; and 15 electric passenger locomotives.

The Pennsylvania will also air-condition, renovate and completely modernize 100 additional passenger coaches at a cost of approximately $3,500,000, as part of its continuing program for the improvement of its passenger-train equipment. The work will be carried out in the railroad's own shops at Altoona, Pa., and is expected to be completed so as to have the cars available for use in the summer of 1942. The first deliveries are scheduled for about the middle of April.

Fifty of the hundred additional cars will be adapted to long-distance service, and will be equipped with reversible and adjustable reclining seats and spacious luggage compartments for the storage of heavy and bulky baggage on extended journeys. The cars will have a seating capacity of 68 passengers each. Ten other cars will be of the combined passenger-baggage type, with similar reversible seats for 36 in the passenger compartment. They will also be used in long-distance trains. Both the full length and combination cars will be streamlined.

For use in the high-speed electrified service between New York, Philadelphia, Pa., Baltimore, Md., and Washington, D. C., 30 cars will be equipped with high back rubber-cushioned reversible seats for 80 passengers each, while ten will be combined passenger-baggage cars with similar seating accommodations for 40 passengers.

All of the cars to be renovated and modernized will be equipped with tight-lock couplers and rubber draft gears, wide windows of double glass, insulation against heat and cold, and the new roller-bearing cast-steel side frame trucks.

St. Louis-San Francisco.—The Frisco has asked the district court for permission to spend $4,302,569 during 1942, of which $2,478,267 will be expended on roadbed repairs and replacements and the balance for improvements to equipment. The company plans to convert 400 freight cars and to enlarge its station at Newburg, Mo., where the patronage of soldiers from Ft. Leonard Wood has increased passenger revenues from $26,569 during the first nine months of 1940 to $2,370,128 for the same period this year.

Seaboard Air Line.—Division 4 of the Interstate Commerce Commission has modified its order of November 4, so as to grant authority to this company to issue and sell $2,448,000 of 2½ per cent equipment trust certificates to the Reconstruction Finance Corporation. Originally, the company was authorized to sell $3,552,000 of certificates, but due to the fact that it was unable to procure the delivery of three Diesel-electric freight locomotives from the Electro-Motive Corporation, it decided to reduce the amount of the issue by $1,476,701. As a result, the total cost of the equipment was cut from $4,838,479 to $3,361,778. Details of the original application were given on page 501 of the November issue.

Southern Pacific.—This company has asked the Interstate Commerce Commission for authority to assume liability for $4,430,000 of 2½ per cent equipment trust certificates, maturing in 10 equal annual installments of $443,000 on January 1 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $5,563,681 and consisting of 700 steel sheathed, wood-lined box cars; 700 all-steel, drop bottom gondola cars; 150 70-ton Hart Selective hopper bottom steel ballast cars; 100 12,500 gallon steel tank cars; 100 12,500 gallon steel tank cars with heater coils; and 50 8,000 gallon steel tank cars with heater coils.

Wabash.—The Wabash has been authorized by the district court to spend $240,000 for three Diesel-electric locomotives.

Wheeling & Lake Erie.—This company has asked the Interstate Commerce Commission for authority to assume liability for $1,050,000 of equipment trust certificates, maturing in equal annual installments on January 1 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as a part of the purchase price of new equipment costing a total of $1,504,372 and consisting of 10 2-8-4 freight locomotives which will be built by the American Locomotive Company.

Supply Trade Notes

International Nickel Company.—*W. J. Calnan, H. D. Tietz,* and *E. A. Turner* have been appointed assistants to the sales manager of the International Nickel Company.

◆

J. V. Freeman has been appointed assistant to the vice-president in charge of coke by-products' sales of all subsidiaries of the United States Steel Corporation with offices at 71 Broadway, New York.

◆

The Whitcomb Locomotive Company has awarded a contract for a one-story factory addition to its plant at Rochelle, Ill., to the E. L. Hallbauer Construction Company. The cost is about $50,000.

◆

Lukenweld, Inc.—*William S. Wilbraham,* manager of sales of Lukenweld, Inc., Coatesville, Pa., has been promoted to manager of costs, and *Robert C. Sahlin,* assistant manager of sales has become manager of sales.

◆

P. S. Nash, assistant vice-president of railroad sales of the Union Asbestos & Rubber Company, Chicago, has been elected vice-president with headquarters at San Francisco, Cal.

◆

Carboloy Company, Inc.—The sales engineering department of the Carboloy Company has been centralized under the direction of *K. R. Beardslee,* sales manager. Martin Muhling, former special engineering executive and Earl Glen, formerly the representative of Carboloy in Pittsburgh, Pa., have been appointed to the newly created positions of assistant sales manager.

◆

Carnegie-Illinois Steel Corp.—*F. R. Gammon* has been appointed manager of sales of the New York district sales office of the Carnegie-Illinois Steel Corporation to succeed *James R. Mills,* who has retired. Mr. Gammon joined the sales force of the Carnegie-Illinois Steel Corporation as special representative in 1936, and on January 1, 1938, was made manager of sales in Cleveland, Ohio, which position he now relinquishes.

◆

The Carnegie-Illinois Steel Corporation, subsidiary of the United States Steel Corporation, has begun work on a $15,000,000 expansion program to provide increased steel and iron making capacity at its Gary, Ind., steel works. Construction will include a new open-hearth furnace, the rebuilding and enlargement of a blast furnace, installation of greater soaking pit capacity, the rebuilding of a battery of coke ovens, and provision for additional ore unloading facilities.

Obituary

Luman R. Dewey, for many years associated with the American Brake Shoe & Foundry Co. until his retirement in 1933, died December 6, at his home in Cattaraugus, N. Y. He was 79 years of age. Mr. Dewey joined the American Brake Shoe & Foundry Co. in 1905 and was appointed western sales manager in 1917, serving in that capacity until his retirement.

◆

Clifford S. Stillwell, executive vice-president of the Warner & Swasey Co., Cleveland, Ohio, and president of the National Machine Tool Builders Association, died of a heart ailment on November 19.

◆

Cleon Melvin Hannaford, sales engineer of the Wine Railway Appliance Division, Unitcast Corporation, died December 8 after a brief illness. He was 50 years of age. Mr. Hannaford began his career in 1913 with the Baltimore & Annapolis as a blue print machine operator, tracer and draftsman, and from 1917 to 1922, served as a draftsman with the Chesapeake & Ohio. He was president of the Car Devices Company, Inc., and sales representative, Railway Supply Company, Richmond, Va., from 1923 to 1936. He became associated with the Wine Railway Appliance Division as sales engineer in 1936. During his career, Mr. Hannaford invented numerous railway mechanical devices.

◆

William H. Winterrowd, vice-president in charge of operations and a director of the Baldwin Locomotive Works, with headquarters at Eddystone, Pa., died suddenly on December 7 in the Bryn Mawr hospital at the age of 57, following injuries sustained in an automobile accident several days previously. Mr. Winterrowd, who was born in Hope, Ind., on April 2, 1884, attended the schools in that city and in 1907 was graduated from Purdue University with the degree of B. S. in mechanical engineering. During his summer vacations he worked as a locomotive wiper on the Missouri Pacific, a blacksmith helper on the Lake Erie & Western, and as a car and airbrake repairman on the Pennsylvania, Lines West of Pittsburgh. Following his graduation he entered the service of the New York Central as a special apprentice and shortly thereafter became assistant to the mechanical engineer at Cleveland, Ohio. In 1912, Mr. Winterrowd went to the Canadian Pacific as mechanical engineer, and in 1915 became assistant chief mechanical engineer. During the World War, after converting part of the railroad's largest shop into a munitions plant, he went to Russia with Sir George Bury, vice-president of the Canadian Pacific, as a member of Lord Milner's mission. Upon his return in 1918, he was appointed chief mechanical engineer of the C. P. R. Mr. Winterrowd joined the Lima Locomotive Works, Inc., in 1923, as assistant to the president and in 1927 was elected a vice-president of that company. In 1934 he became vice-president of the Franklin Railway Supply Company, which position he left in 1939 to become vice-president in charge of operations of the Baldwin Locomotive Works. In this capacity he directed the production, not only of locomotives, but also of the many items of ordnance material being manufactured by Baldwin, including medium and heavy tanks. In 1936 Mr. Winterrowd was given the degree of doctor of engineering by Purdue University. At the time of his death he was president of the Purdue Alumni Association.

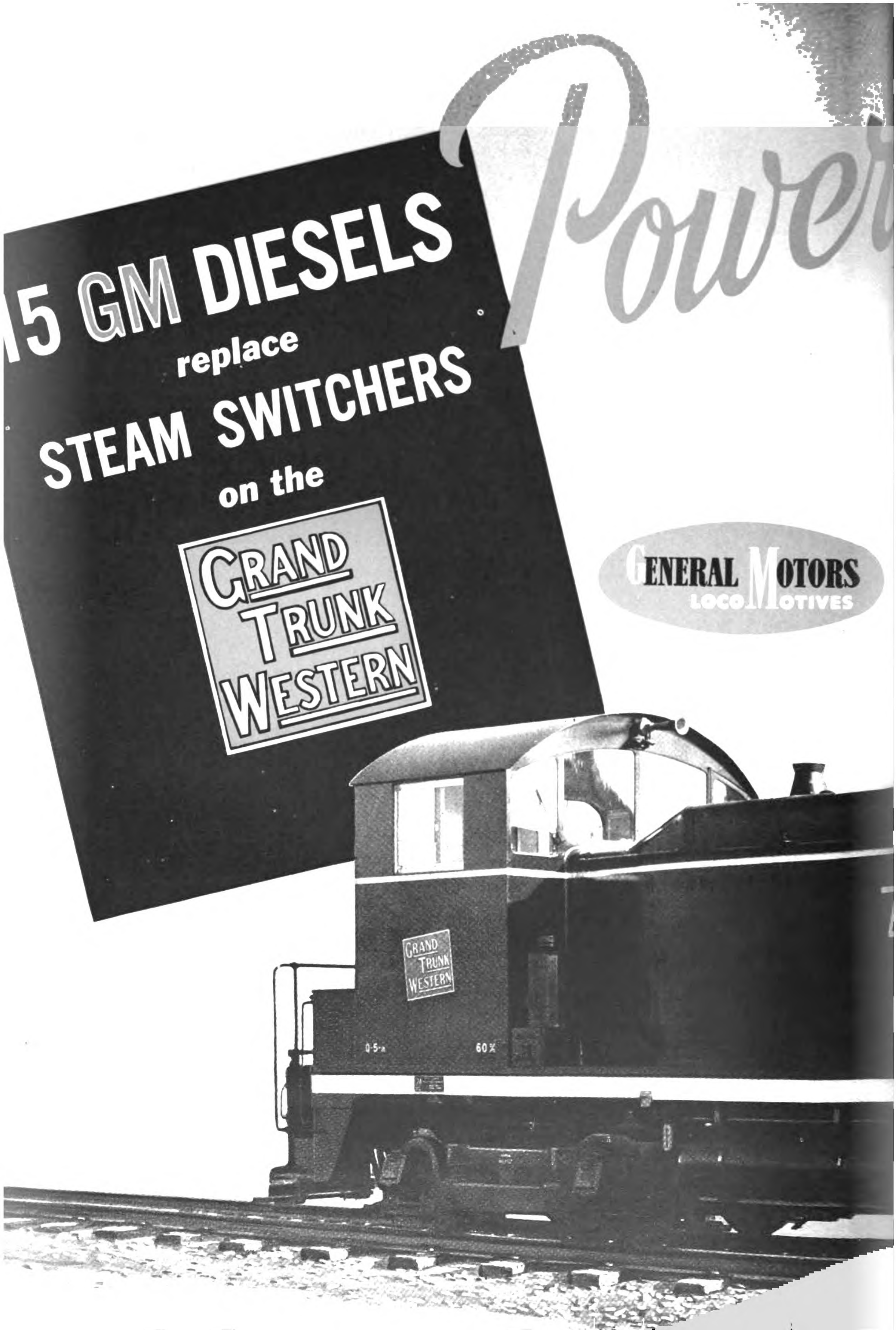
W. H. Winterrowd

He was a life member of the Mechanical Division of the A. A. R.; a member of the Railway Fuel & Traveling Engineers' Association, and a member of many railway clubs. He was past chairman of the Railroad Division and of the Publications Committee of the A. S. M. E. For the past three years he had served as a manager and for the past two years as a member of the Executive Committee of the society and had just been elected a vice-president. He had membership in the Newcomen Society, and was on the Board of Managers of the Franklin Institute. Mr. Winterrowd was the author of a number of papers dealing with railway operation and motive-power and rolling-stock design and operation.

◆

William R. Gillies, vice-president of the Union Asbestos & Rubber Co., with headquarters at San Francisco, Cal., died on November 24. Mr. Gillies was born at Vincennes, Ind., on October 25, 1879. He entered railway service in 1914 in the mechanical department of the Oregon Short Line and in 1916 was promoted to mechanical engineer. He resigned from this position in 1919 to become assistant to the president of the Union Asbestos & Rubber Co., with jurisdiction over the development of products and sales. In 1922, he was elected vice-president in charge of western railroad sales and in November, 1939, was placed in charge of production, engineering and research, with headquarters at Cicero, Ill. In the following year he transferred his headquarters to San Francisco.

(*Turn to second left-hand page*)


15 GM DIESELS
replace
STEAM SWITCHERS
on the
GRAND TRUNK WESTERN
Powe
GENERAL MOTORS
LOCOMOTIVES
GRAND TRUNK WESTERN

Personal Mention

General

George H. Emerson, chief of motive power and equipment on the Baltimore & Ohio with headquarters at Baltimore, Md., has retired.

J. J. Tatum, assistant chief of motive power and equipment on the Baltimore & Ohio with headquarters at Baltimore, Md., has retired.

F. H. Einwaechter, Jr., assistant engineer in the locomotive department on the Baltimore & Ohio, has become mechanical engineer, at Baltimore, Md.

W. B. Whitsitt, assistant chief of motive power and equipment on the Baltimore & Ohio with headquarters at Baltimore, Md., has been appointed chief engineer of motive power and equipment in charge of research, design, standards and new construction at Baltimore.

Howard Hill, master mechanic of the Philadelphia division on the Reading at Philadelphia, Pa., has become assistant superintendent of motive power and rolling equipment at Reading, Pa.

A. K. Galloway, superintendent of motive power and rolling equipment on the Reading at Reading, Pa., has become general superintendent of motive power and equipment on the Baltimore & Ohio with headquarters at Baltimore, Md.

G. H. Massy, division master mechanic in charge of the central and southern subdivisions on the Central of New Jersey at Jersey City, N. J., has become assistant superintendent of motive power and rolling equipment at Elizabethport, N. J.

Ernest P. Gangewere, assistant superintendent of motive power and rolling equipment on the Reading with headquarters at Reading, Pa., has been appointed superintendent of motive power and rolling equipment of the Reading and the Central of New Jersey, with the same headquarters.

William Moore, shop superintendent of the Hornell back shop of the Erie at Hornell, N. Y., has been promoted to the position of assistant to the superintendent of motive power, with headquarters at Cleveland, Ohio.

R. G. Webb, assistant superintendent on the Chicago, Milwaukee, St. Paul & Pacific at Lewistown, Mont., has been appointed superintendent of air brakes, with headquarters at Milwaukee, Wis., a newly created position.

J. E. Goodwin, master mechanic on the International-Great Northern (part of the Missouri Pacific lines), with headquarters at San Antonio, Tex., has been appointed to mechanical superintendent, Southern district, of the Missouri Pacific, with headquarters at St. Louis, Mo. A photograph and sketch of Mr. Goodwin appeared on page 11 of the May, 1941, *Railway Mechanical Engineer.*

J. M. Nicholson, general assistant, mechanical department, Atchison, Topeka & Santa Fe, has been promoted to assistant to the operating vice-president (mechanical), with headquarters as before at Chicago, succeeding John Purcell, who retired on January 1. A photograph and biography of Mr. Nicholson were published in the *Railway Mechanical Engineer* of August, 1941.

John Purcell, assistant to the operating vice-president (mechanical) of the Atchison, Topeka & Santa Fe, retired on January 1, after 57 years of service. Mr. Purcell was born at St. Charles, Mo., on January 19, 1870, and entered railroad service on October 3, 1884, as a machinist apprentice on the Santa Fe. He was advanced to gang foreman in 1887, and then served in various positions until about 1898 or 1899 when he was appointed master mechanic at Argentine, Kan. He was later transferred to Shopton, Ia., and in April, 1902, was promoted to superintendent of the Topeka shops. In May, 1912, he was further advanced to assistant to the operating vice-president (mechanical), with headquarters at Chicago, continuing in that position until his retirement, except during the period of federal control, when

J. Purcell

he was assistant to the federal manager of the Santa Fe. Mr. Purcell is a life member of the Mechanical division of the Association of American Railroads. He served as chairman of that division in 1923 and 1924 and has been a member of its General committee since 1920 and of its Committee on Research since 1933. He also served from 1914 to 1919 as a member of the Executive committee of the former American Railway Master Mechanics' Association, as a member of the Committee on Standards for Locomotives and Cars of the U. S. Railroad Administration in 1918 and as a member of the Mechanical Advisory committee under the Federal Co-ordinator of Transportation in 1934.

In 57 years of experience, all on one road, Mr. Purcell demonstrated those rare executive qualities resulting in his rapid rise to head the mechanical department of the Santa Fe, and also enabling him to assume leadership in the effective work which the A. A. R., Mechanical Division, has done throughout the years to further mechanical progress on all roads. Mr. Purcell's achievements in the mechanical field have been recognized by his election to membership in the American Society of Mechanical Engineers.

A diminutive Irishman, aggressive, impulsive and famous for his linguistic powers, John Purcell is perhaps best known as an organizer and developer of men, many of whom, on the Santa Fe and other roads, are products of the apprentice training course which he was an important factor in founding and bringing to its present state of efficiency. In his own early days, Mr. Purcell is said to have participated in many scrapes, as well as scraps. Knowing young men as he does, he has not only insisted on hard work and rigid discipline, but tempered his decisions with justice and kindness. At an anniversary dinner, held in the big auditorium of the motive power building at Topeka, Kan., in 1937, and largely attended by Santa Fe officers and mechanical department employees, Mr. Purcell was toasted as a "Maker of Men," the "Man who invented work" and "Our best friend."

Throughout the years, Mr. Purcell's major interest in life has been "railroading," but he has always found time to take an active interest in public affairs and, in times of emergency, like the Topeka flood in 1903, he gave all of his energy and talents to organizing relief. His contributions to public welfare and his personal charities to young men and friends, both inside and outside the Santa Fe organization, are as widely distributed as they are little known.

Edred B. Hall, chief mechanical officer of both the Chicago & North Western and the Chicago, St. Paul, Minneapolis & Omaha, retired on December 1. Mr. Hall was born at Parkersburg, Iowa, on December 1, 1870, and entered railway service in July, 1889, as a shop and enginehouse mechanic on the C. & N. W. at Hawarden. In 1892, he became a locomotive fireman and, in 1898, was promoted to locomotive engineman. On September 23, 1907, Mr. Hall became road foreman of engines at Sioux City, Iowa, and on March 1, 1910, master mechanic on the Northern Iowa and Sioux City division, with headquarters at Eagle Grove, Iowa. On May 1, 1912, he was transferred to the Wisconsin division, with headquarters at Chicago, and in December, 1914, was promoted to the position of assistant to the general superintendent of motive power and machinery at Chicago, handling labor matters. In 1917, Mr. Hall was appointed assistant superintendent of the Milwaukee division, with headquarters at Milwaukee, Wis.; in 1919, assistant superintendent of motive power and machinery, with headquarters at Chicago; on May 1, 1922, superintendent

of motive power and machinery, and in September, 1927, general superintendent of motive power and machinery. He was appointed also general superintendent of motive power and machinery of the Omaha in 1929, and in August, 1939, became chief mechanical officer of both roads. Mr. Hall

Edred B. Hall

was president of the Western Railway Club in 1921-1922, was chairman of the Mechanical division of the Association of American Railroads in 1934-1935, and in 1932 was chairman of the General committee of the A. A. R., Mechanical division, of which committee he is still a member.

HARRY P. ALLSTRAND, assistant to the chief executive officer of the Chicago & North Western, has been appointed chief mechanical officer, with headquarters as before at Chicago. Mr. Allstrand was born at Council Bluffs, Iowa, on September 8, 1885, and graduated from Iowa State College in 1913. He entered railway service in 1903 as a machinist apprentice on the C. & N. W. at Missouri Valley. In 1907,

Harry P. Allstrand

he became a machinist and, later, foreman at Missouri Valley. In 1909, he left railway service to attend college at Ames, Iowa, returning to the North Western after graduation in 1913, as an enginehouse foreman at Clinton, Iowa, later being transferred to South Pekin, Proviso, Ill., and East Clinton, Iowa. Mr. Allstrand became division foreman at Chadron, Neb., in 1918, and in 1919 was promoted to assistant master mechanic. He later served as master mechanic at Chadron and at Eagle Grove, Iowa, Belle Plaine and Boone. In 1924, he was appointed efficiency supervisor, with headquarters at Chicago, and in 1926, became assistant superintendent of motive power and machinery, with the same headquarters. Mr. Allstrand was appointed principal assistant superintendent of motive power and machinery in 1929, and assistant to the chief executive officer in August, 1939. Mr. Allstrand was president of the Western Railway Club in Chicago, in 1929-30. He is vice-chairman of the A. A. R. Mechanical division Committee on Locomotive Construction and has recently been elected to membership on the Executive Committee of the A. S. M E., Railroad division.

PAUL O. CHRISTY, superintendent of equipment on the Illinois Central at Chicago, has been appointed general superintendent of equipment, with the same headquarters, succeeding his brother, G. C. Christy, who has retired because of ill health. A photograph and biography of Paul O. Christy were published in the April, 1941, issue of the *Railway Mechanical Engineer,* following his appointment to the position of superintendent of equipment.

G. C. CHRISTY, general superintendent of equipment on the Illinois Central at Chi-

G. C. Christy

cago, has retired because of ill health. Mr. Christy was born at Holly Springs, Miss., in 1884, and entered railway service as a helper in the paint shop of the Illinois Central at Water Valley, Miss., in 1898, while on vacation from school. Two years later he was transferred to the machine shop as an apprentice and upon the completion of his apprenticeship in March, 1904, he served until 1911 as a machinist and a foreman. In October of the latter year he became general foreman at Water Valley and in December, 1914, was transferred to McComb, Miss. Mr. Christy was promoted to master mechanic of the Greenville and New Orleans division, with headquarters at Vicksburg, Miss., in July, 1917, and in 1926, his jurisdiction was extended to include the Vicksburg Route division. On November 1, 1929, he was appointed superintendent of the car department, with headquarters at Chicago; on November 1, 1937, superintendent of motive power, and in March, 1939, he was appointed general superintendent of equipment.

Master Mechanics and Road Foremen

H. T. SNYDER, master mechanic on the Union Pacific at Cheyenne, Wyo., has been transferred to Kansas City, Kans.

W. L. JONES, master mechanic on the Illinois Central at Champaign, Ill., has been transferred to Jackson, Tenn.

L. A. ALLARD, assistant master mechanic on the Missouri Pacific at Kansas City, Mo., has been appointed master mechanic of the Joplin, White River, Wichita divisions, with headquarters at Nevada, Mo.

Shop and Enginehouse

G. R. SEITZ has been appointed shop superintendent of the back shop of the Erie at Hornell, N. Y.

WALTER R. SEDERQUEST, master mechanic of the Boston (Mass.) division on the New York, New Haven & Hartford, who has been appointed superintendent of the Readville (Mass.) shops, as announced in the November issue, was born on March 24, 1888, at Greely, Colo. Mr. Sederquest attended grammar school and a school of mechanical arts, and entered railway service in October, 1904, with the Boston & Maine. On January 13, 1907, he became a machinist on the New Haven at Boston, and in November, 1911, was promoted to the position of foreman. He became general foreman at New Haven, Conn., on March 1, 1916, and master mechanic on the Old Colony division at Taunton, Mass., on December 15, 1923. On February 15, 1929, Mr. Sederquest was transferred to the Midland division, with headquarters at Boston where he continued as master

W. R. Sederquest

mechanic through the consolidation in 1931 of the Midland, Old Colony and Boston divisions into the Boston division.

Obituary

C. W. COOK, master mechanic for the Seaboard at Atlanta, Ga., died on December 19.

Railway Mechanical Engineer

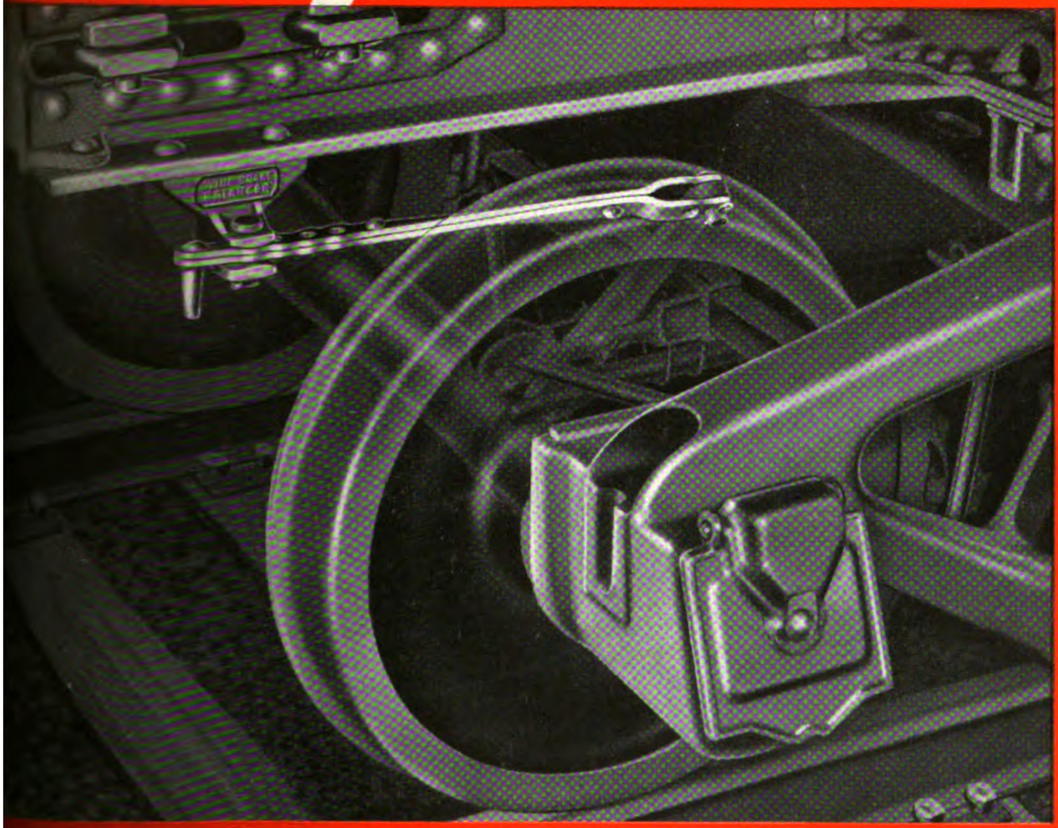
February
1942

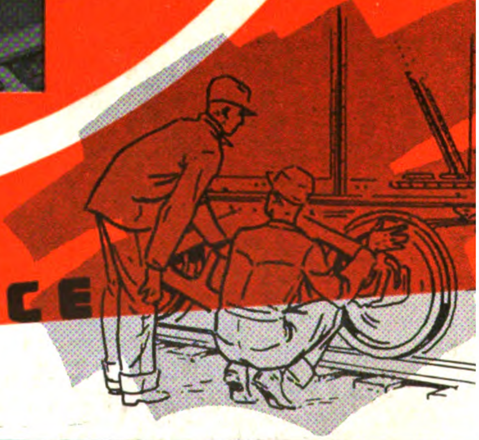
alike
alike
like

FOUNDED IN 1832

Wine BRAKE BALANCER

EQUALIZES
BRAKE
FORCES





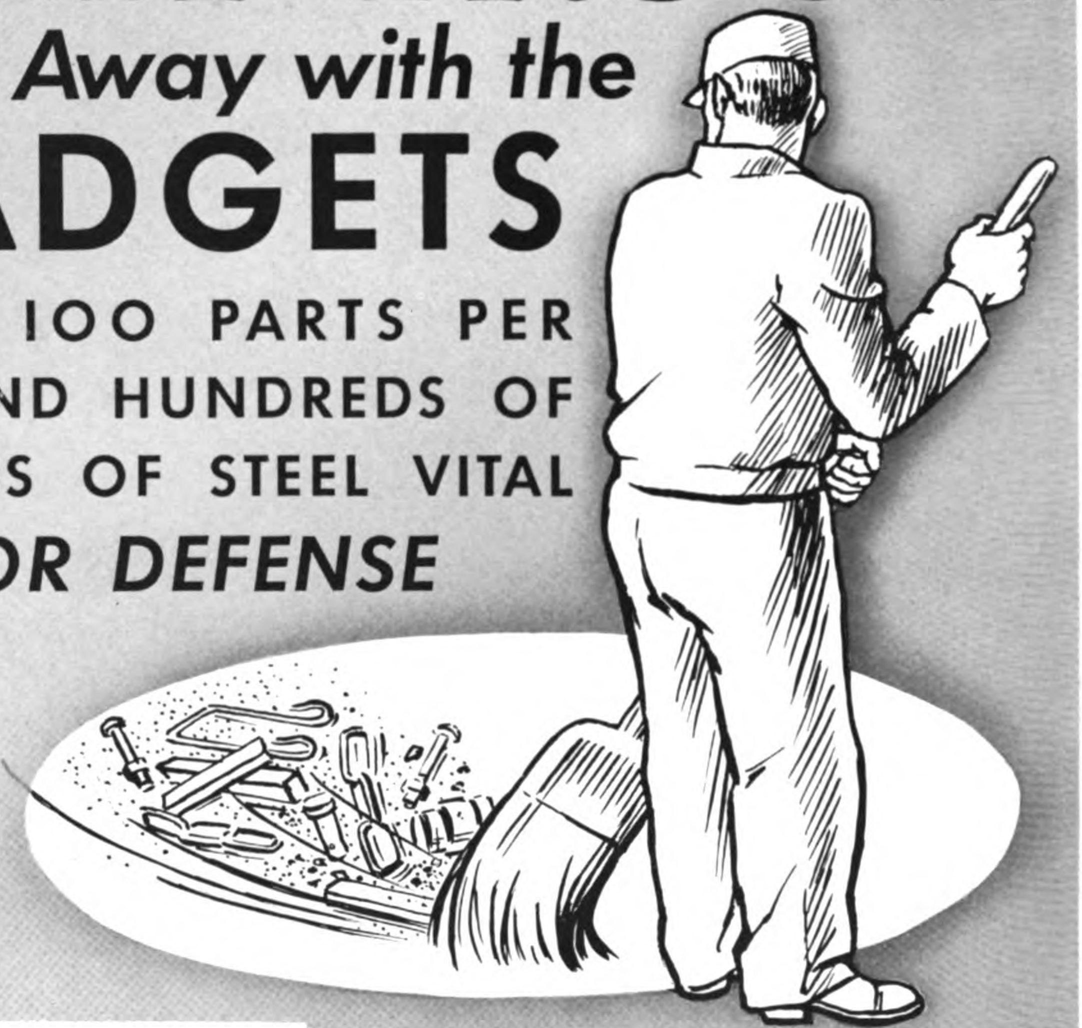
EDUCE TRUCK MAINTENANCE

HE Wine RAILWAY APPLIANCE CO

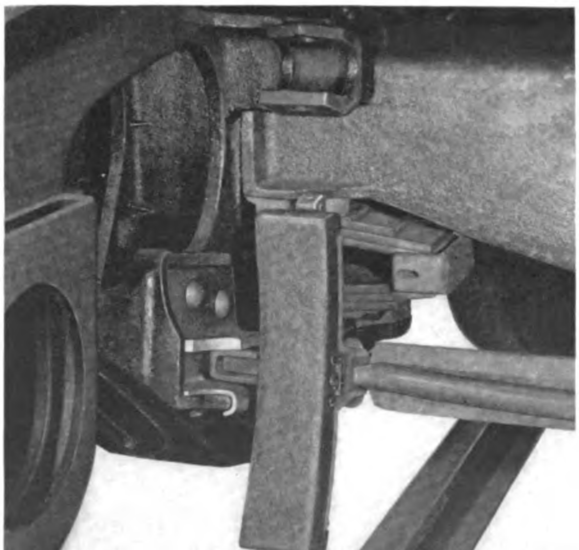
TOLEDO OHIO

UNIT TRUCK

Does Away with the GADGETS



SAVES 100 PARTS PER CAR AND HUNDREDS OF POUNDS OF STEEL VITAL *FOR DEFENSE*



WITH a maximum effort toward conservation, it is well to provide your freight cars with better brake beam suspension. Unit Trucks require no brake hangers, pins, safety devices or other auxiliary methods of carrying the brake beam. A simple bracket, part of the truck frame, interlocks the Unit Brake Beam and guides it as it should be — toward the center of the wheel. Results — simplified construction, uniform brake shoe wear, increased wheel and bearing life and elimination of derailments from dropped brake rigging. All around money savers, certainly.

Approved for Interchange

Full information as to licensees authorized to manufacture Unit Trucks will be furnished upon request.

UNIT TRUCK CORPORATION

140 CEDAR STREET NEW YORK, N. Y.

Published monthly by Simmons-Boardman Publishing Corporation, 1309 Noble Street, Philadelphia, Pa. Entered as second class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, $3.00 for one year, U. S. and Canada. Single copies 35 cents. Vol. 116, No. 2

RAILWAY MECHANICAL ENGINEER

Founded in 1832 as the American Rail-Road Journal

With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office.

Volume 116 *No. 2*

FEBRUARY, 1942

Published on the second day of each month by

Simmons-Boardman Publishing Corporation

1309 Noble street, Philadelphia, Pa. Editorial and Executive Offices: 30 Church street, New York, and 105 West Adams street, Chicago. Branch offices: Terminal Tower, Cleveland; 1081 National Press bldg., Washington, D. C.; 1038 Henry bldg., Seattle, Wash.; 550 Montgomery street, Room 805-806, San Francisco, Calif.; 530 W. Sixth street, Los Angeles, Calif.

Subscriptions (including, when published, the daily editions of the Railway Age, published in connection with the convention of the Association of American Railroads, Mechanical Division), payable in advance and postage free, United States, U. S. possessions and Canada: 1 year, $3; 2 years, $5. Foreign countries, not including daily editions of the Railway Age: 1 year, $4; 2 years, $7. Single copies, 35 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.), and is indexed by the Industrial Arts Index and also by the Engineering Index Service. PRINTED IN U. S. A.

Three Roads Place

Pendulum Cars in Service

Santa Fe, Great Northern and Burlington each receive one of the new Hill cars with stressed-skin bodies spring-supported above the center of gravity

THE Hill pendulum-type passenger car, first constructed and placed in test service by the Pacific Railway Equipment Company, Los Angeles, Cal., early in 1938, has been further improved and three new cars recently delivered, one to the Atchison, Topeka & Santa Fe, one to the Great Northern and one to the Chicago, Burlington & Quincy. These cars are all de luxe chair cars, or coaches, practically identical in size and structural design, the only difference being in interior arrangement. The Santa Fe car, with 9 ft. 9 in. in one end devoted to men's rooms and a total of 11 ft. in the other end utilized for women's lounge and wash rooms, has a seating capacity in the coach section of 56. The Burlington car, with slightly less lounge space, seats 60. The Great Northern, with a single 6-ft. 1-in. wash room for men and another for women in one end of the car, has a seating capacity of 68. A 3-ft. 8-in. space on either side of the center aisle above the truck support springs is devoted to locker space in each car. The coupled car length is 85 ft. and light-weight 109,000 lb.

Car Bodies Suspended Above the Center of Gravity

The object of developing the pendulum-type car has been to produce a car-body suspension system which will give the requisite insulation against vibration and maintain stability, these goals being achieved in conjunction with maximum comfort at high speed on ordinary track with safety and economy of weight. In taking curves above superelevation speeds, the outward force acting on the center of gravity causes the car body to move pendulum-wise, adding effectively to the superelevation of the track insofar as comfort and stability within the car are concerned. The actual support at each end of the car is at two points on either side of the center line, a third attachment between the truck and the car body below the floor level serving to position the truck longitudinally with respect to the car body. No objectionable interference with normal use of the car interior is introduced by this method of suspension. The desired motions are provided by flexure of the support system, suitably positioned and restrained. In the present form, all motions between the truck and car body occur solely through elastic flexure, leading to a simple lightweight truck and suspension system.

The car body rests on soft-action coil springs which are recessed into the car structure on either side of the center aisle. These springs carry only vertical load and allow within limits of safe stress sufficient horizontal movement of the top relative to the bottom for all lateral and turning movements of the truck in normal service. Lateral movement of the car body floating on the main springs is restrained by control arms and links which act on the body above the center of gravity. The control arms are flat-leaf steel springs with progressive stops which give a variable spring rate for lateral motion so that the car floats about a center position with small restraint, equivalent to the action of very long swing hangers and is brought to a yielding stop for large, lateral swings.

The longitudinal position of the truck is maintained by the thrust tube or "wagon tongue" which is anchored in rubber near the center of the truck frame and at the other to the car underframe. The rubber mountings of the longitudinal tie permit lateral movement and angular movement of the truck on curves, and constitute barriers against noise transmission. The coil spring suspension involves no sliding or rotating parts carrying the weight of the car. The elements which have been described replace the center plate, side bearings, bolster, chafing plates, bolster springs, spring plank and swing hangers used in all standard passenger-car trucks.

Principal Dimensions, Weights and Seating Capacities of New Pendulum Car

Salable seats:	
Santa Fe	56
Great Northern	68
Burlington	60
Coupled length, ft.-in.	85-0
Length over body end posts, ft-in.	82-8
Length between truck centers, ft.-in.	60-0
Overall width, ft.-in.	10-0
Inside width, passenger compartment, ft.-in.	9-5
Overall height, ft.-in.	13-5
Inside height, passenger compartment, ft.-in.	8-½
Height of body suspension above rail, ft.-in.	7-3
Height of center of gravity above rail, ft.-in.	6-1
Truck wheelbase, ft.-in.	9-0
Lightweight of car, lb.	109,000
Weight of two trucks, lb.	31,000
Weight of body structure, lb.	32,000
Weight of equipment and furnishings, lb.	46,000

The successful performance of the experimental trucks indicated that the journal springs should be relatively stiff. The journal coil springs are mounted just above the boxes, and are applied so that some lateral movement can take place between the journal boxes and the truck frame. This movement is permitted by rubber and steel vulcanized pads on the side of the pedestals which are deflected in compression to relieve lateral shocks. The arrangement of parts is different from that used on the experimental cars but the characteristics are the same. The truck frames are arc-welded of high-tensile, low-alloy steel and are stress-relieved before machining.

Large Coil Springs Support the Car Body and Cushion Road Shocks

Eight body springs are used per truck, four on each side. These springs are mounted just above the frame side members and extend upward 26 in. within the body to the body-support structure. The static deflection of 10 in. together with the rubber insulator at the top of the springs with a deflection of 3/8 in. is said to insulate the car body thoroughly from disturbances in the truck. As in the case of the experimental car springs considerable analytical and test work was performed to establish correct relationships between static deflection, working height, and pitch diameter to obtain freedom of lateral

Interior of the Santa Fe coach

movement and stability. In these springs, the greatest lateral movement encountered in normal service increases the working stress near the ends of the coils by 25 per cent.

The lateral springs consist of two plates clamped rigidly to the side of the truck frame extending between the body-support bulkheads to a point above the center of gravity of the body. Rubber-cushioned progressive lateral stops shorten the effective spring length with increased deflection, and thereby increase the spring rate with deflection. Lateral tie rods with rubber-mounted end connections attach the lateral spring to the car body at a point about 20 in. above the center of gravity of the entire body assembly.

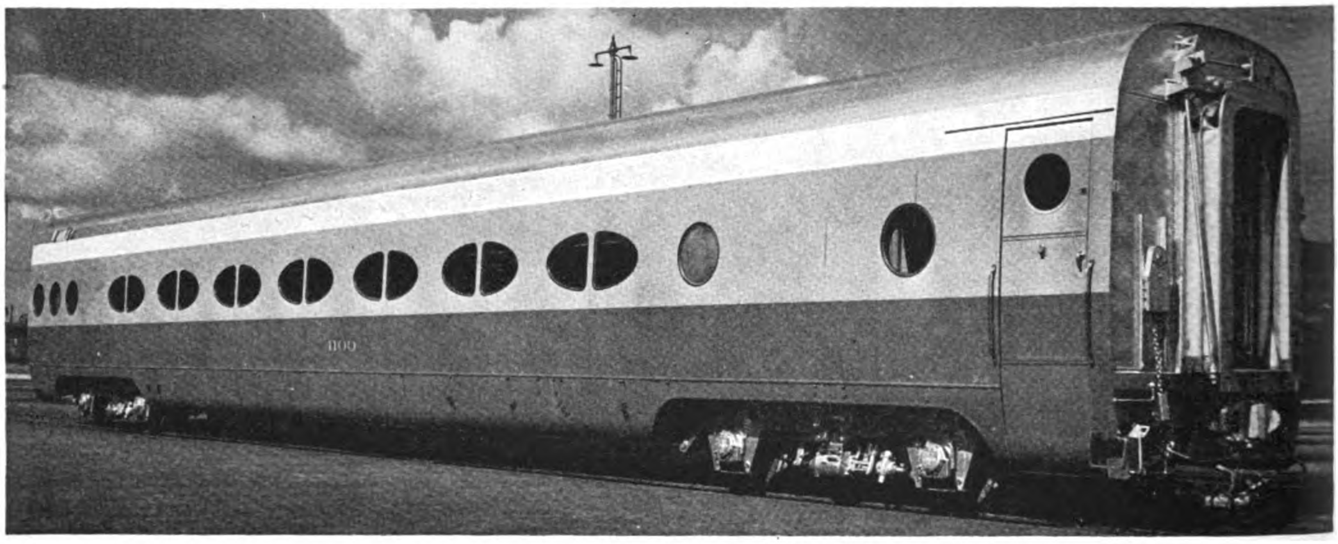
Hydraulic shock absorbers, mounted on the side of the truck frame, are connected by means of long vertical tie rods to the body structure. These two vertical tie rods, also used to hold the truck to the car body in case of derailment or overturning, are designed to meet the Association of American Railroads strength requirement. Hydraulic shock absorbers, mounted in the body-support structure, are connected by means of lateral links to the tops of the lateral spring housings which are rigidly attached to the truck frames at their lower ends.

The truck thrust tube, used to position the truck longitudinally with respect to the body, is connected to the truck through a large rubber fitting at the center of the transom. The body connection of the thrust tube is made through a similar fitting attaching to a bracket mounted directly under the draft-gear pocket. This thrust tube also is designed to meet requirements of the A. A. R. for crash conditions.

The truck wheels, axles and bearings conform to railroad standards for light modern equipment. Wheels are rolled steel, 36 in. in diameter, triple wear. Journal bearings, designed for 5½-in. by 10-in. journals, are of the Timken taper-roller type. Simplex unit-cylinder clasp brake equipment, designed especially for use on this type of truck, is installed.

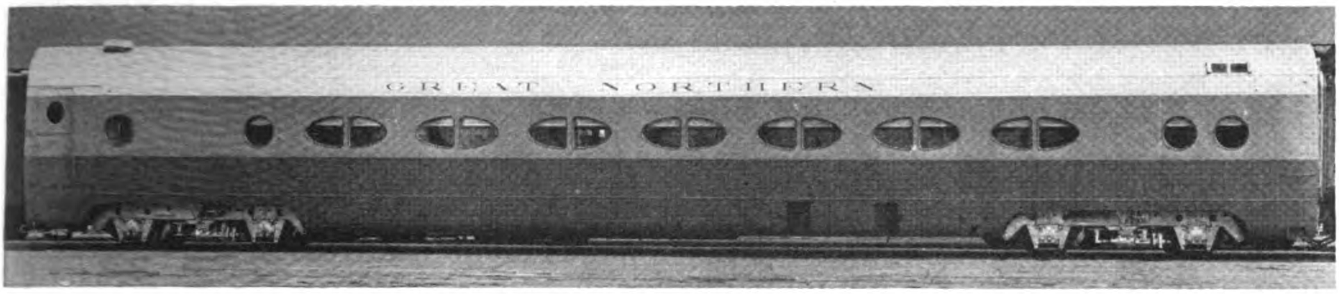
How the Steel Car Bodies Are Constructed

The essential structural elements of the steel stressed-skin construction embodied in the body of this car are: (1) thin skin or sheathing; (2) longitudinal stiffening members; (3) transverse stiffening carlines at the roof; side posts at the sides; and floor beams, or cross-bearers on the underframe; (4) structural bulkheads through which vertical and lateral loads are transferred to and from the body structure; and (5) miscellaneous structures, such as heavy end frames, essential for housing draft and buff gear; center sill, essential for heavy buff and draft loads; and the body spring-supporting elements.



One of the Hill pendulum-type cars built for the Atchison, Topeka & Santa Fe

Both the longitudinal and the transverse stiffening members are light in weight. They are rigidly fastened to, and act integrally with, the skin. The longitudinally corrugated flooring is a pressed sheet with closely spaced



Pendulum car built for the Great Northern by the Pacific Railway Equipment Company

stiffeners. All of these elements are inter-connected to form an integrated continuous unit.

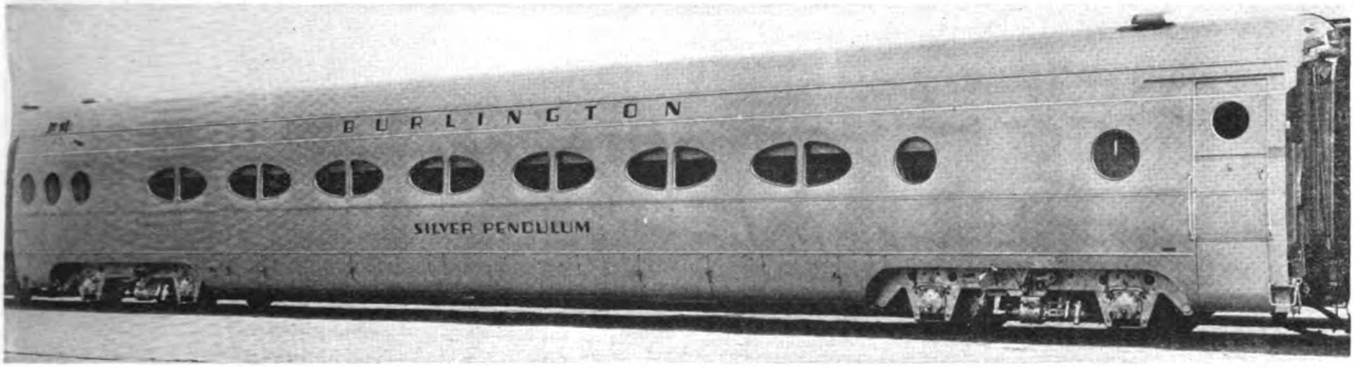
In the interior of the structural shell, there are several features which illustrate the functional importance of this continuity. The longitudinal flooring, one of the most highly worked portions of the structure, is responsible for much of the overall continuity of the design. Considered as a portion of the center-sill construction with the center sill and shear panels, the flooring carries compression loads; heavy concentrations of equipment and live load are distributed over several floor beams. The flooring is also capable of transmitting about 40 per cent of the buff loads from the center construction to the sides of the car, and at the same time carries the live and dead load between the floor beams. The longitudinal stiffening members, with their portion of effective skin, the flooring, and the center sill, supply adequate strength to resist all bending and compression loads.

The support-structure bulkheads transfer uniformly the vertical and horizontal reactions of the truck to the sides and roof of the car. Continuous transverse rings are formed by virtue of the fact that the floor beams are rigidly fixed to the bottoms of the side posts of the side panel, and these side posts are rigidly tied to the carlines of the roof panel. This complete ring around the car is capable of transferring the load on the floor beam to the side sheet, and of withstanding the accompanying thrust, moment, and shear at all points. These rings are designed to prevent spreading or squashing of the thin side and roof sheets when the car is loaded. The curved contour of the body affords a convenient means of transferring load through the structure.

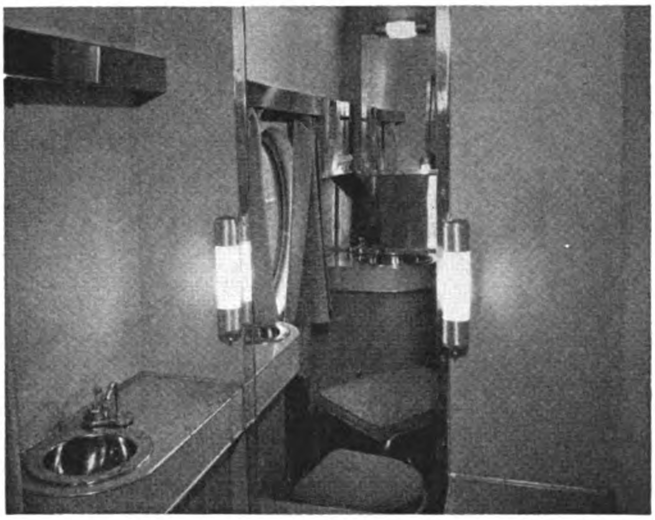
In addition to providing for basic vertical, lateral, buff and draft loads, the car is designed to meet the A. A. R. strength specification requirements.

The Stressed-Skin Steel Construction

Some of the important advantages of the stressed-skin steel construction used in this new car are summarized as follows: The flooring is shear-connected into the structure, making the car body a huge tube, closed at both ends, with a high degree of torsional rigidity. The bending rigidity of the structure is likewise high since all the effective material is disposed as far from the neutral axis as possible. Consequently, under normal operating loads, the maximum stresses in the structure are low. Elliptical windows reduce stress concentrations and increase the shear rigidity of the body.



A Hill pendulum car recently delivered to the Chicago, Burlington & Quincy



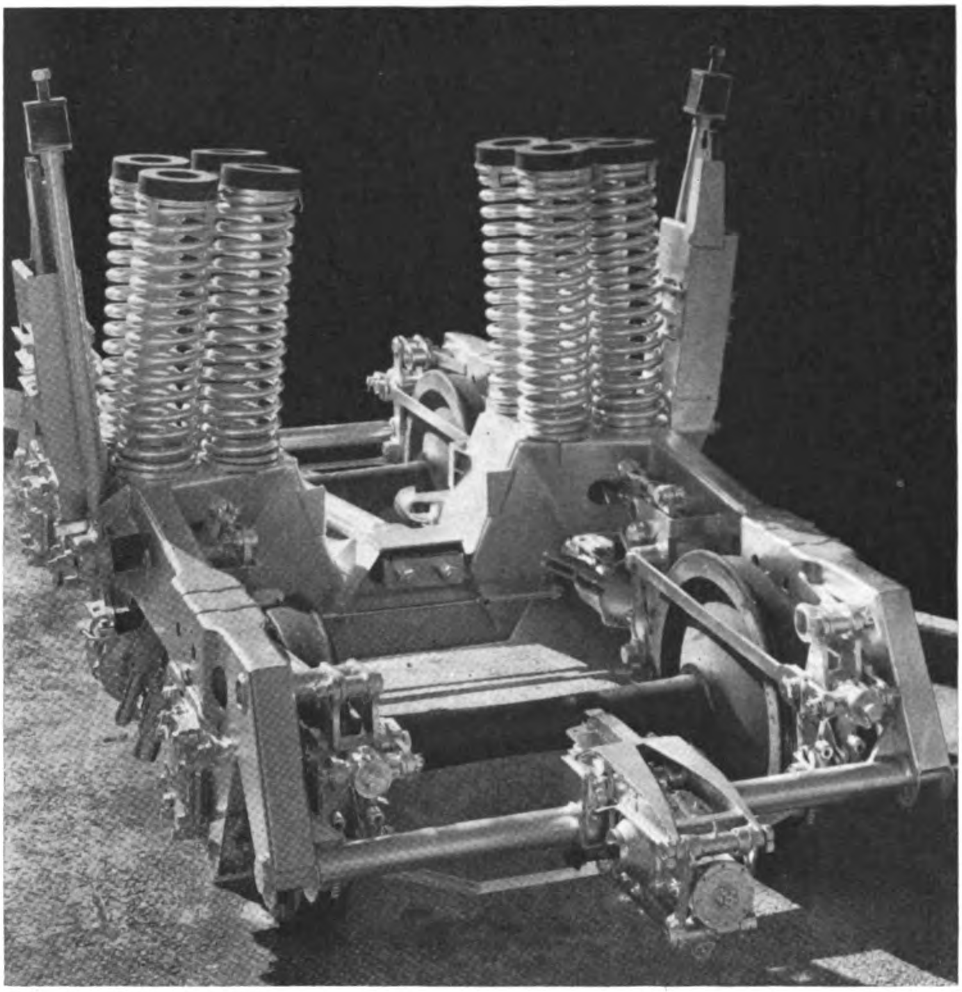
In one of the women's dressing rooms

The use of closely spaced longitudinal stiffeners around the entire periphery of the structure, to reduce buckling and increase the total effective width of the sheathing, results in increased collision protection of the passengers, both for end and side loads. The side collision strength is further improved not only by the close spacing of side posts and carlines, but also by the fact that the floor beams, side posts, and carlines are alined and spliced

together to form a series of continuous frames, or rings, throughout the length of the car.

End-collision strength is improved by the large number of longitudinal stiffeners around the entire periphery, as well as by the fact that the corrugated flooring is arranged to have its corrugations parallel to the longitudinal axis of the car. The flooring also has a rigid shear connection to the center sill, so that loads applied to the center sill are distributed to the rest of the car structure.

The entire car body structure, with the exception of the arc-welded end framing, draft gear attachments and miscellaneous connections, is fabricated with controlled spot welding.



Pendulum car truck fabricated by welding and designed to support the car body 14 in. above the center of gravity

Partial List of Materials and Equipment Used on the Santa Fe, Great Northern, and Burlington Pendulum Cars

Steel for car bodies:	
Stainless	Columbia Steel Co., Los Angeles, Calif.
High-tensile, low alloy	Youngstown Sheet & Tube Co., Youngstown, Ohio.
Car bodies	Consolidated Steel Corp., Ltd., Los Angeles, Calif.
Car-body ribs and stiffeners	Van Huffel Tube Corporation, Warren, Ohio.
Car-body springs	American Locomotive Co., Railway Steel Spring Div., New York.
Center sills (stainless steel)	Edward G. Budd Manufacturing Company, Philadelphia, Pa.
Truck frames (SF-GN)	Lukenweld, Inc., Coatesville, Pa.
(CB&Q)	Consolidated Steel Corp., Ltd., Los Angeles, Calif.
Truck molded rubber parts	Gates Rubber Company, Denver, Colo.
Shock absorbers	Houde Engineering Corp., Buffalo, N. Y.
Truck castings	Warman Steel Casting Co., Huntington Park, Calif.
Nuts	Grip Nut Company, Chicago. Elastic Stop Nut Corp., Union, N. J.
Wheels and axles (GN-CB&Q)	Bethlehem Steel Co., Los Angeles, Calif.
(SF)	Standard Steel Works Division of The Baldwin Locomotive Works, Philadelphia, Pa.
Roller bearings and journal boxes	The Timken Roller Bearing Co., Canton, Ohio.
Journal-box oil gages (SF)	The Ohio Injector Co., Chicago.
Couplers and yokes (GN)	Buckeye Steel Castings Company, St. Paul, Minn.
(SF-CB&Q)	National Malleable & Steel Castings Co., Cleveland, Ohio.
Draft gear and buffers	W. H. Miner, Inc., Chicago.
Air-brake equipment (GN)	New York Air Brake Co., New York.
(SF-CB&Q)	Westinghouse Air Brake Co., Chicago.
Hand brakes	National Brake Company, New York.
Brake shoes	American Brake Shoe & Foundry Co., San Francisco, Calif.
Clasp brakes, journal and lateral control springs	American Steel Foundries, Chicago.
Lateral control springs	Standard Steel Spring Company, Coraopolis, Pa.
Insulation:	
Car body (SF)	Gustin-Bacon Mfg. Co., Kansas City, Mo.
(GN-CB&Q)	Johns-Manville Sales Corp., San Francisco, Calif.
Dednox	Dednox, Inc., Chicago.
Airacoustic sound	Johns-Manville Sales Corp., San Francisco, Calif.
Pipe—Steam line, hot- and cold-water lines	Johns-Manville Sales Corp., San Francisco, Calif.
Water-line	Union Asbestos & Rubber Co., Cicero, Ill.
Insulation tape, cork board slabs for insulation	Armstrong Cork Company, Los Angeles, Calif.
Folding trap steps and window sashes	O. M. Edwards, Inc., Syracuse, N. Y.
Air-conditioning equipment (CB&Q)	The Trane Co., Chicago.
(SF)	Safety Car Heating & Lighting Co., Inc., New York.
(GN)	Frigidaire Div., General Motors Corp., Dayton, Ohio.
Generators (SF-GN)	Safety Car Heating & Lighting Co., Inc., New York.
(CB&Q)	General Electric Company, Los Angeles, Calif.
Generator mounting supports	United States Rubber Co., Los Angeles, Calif.
Generator V-belt and gear drive (GN-CB&Q)	Safety Car Heating & Lighting Co., Inc., New York.
Anemostats	Anemostat Corporation of America, New York.
Air filters	American Air Filter Co., Inc., Louisville, Ky.
Air grilles for doors	Barber Colman Co., Los Angeles, Calif.

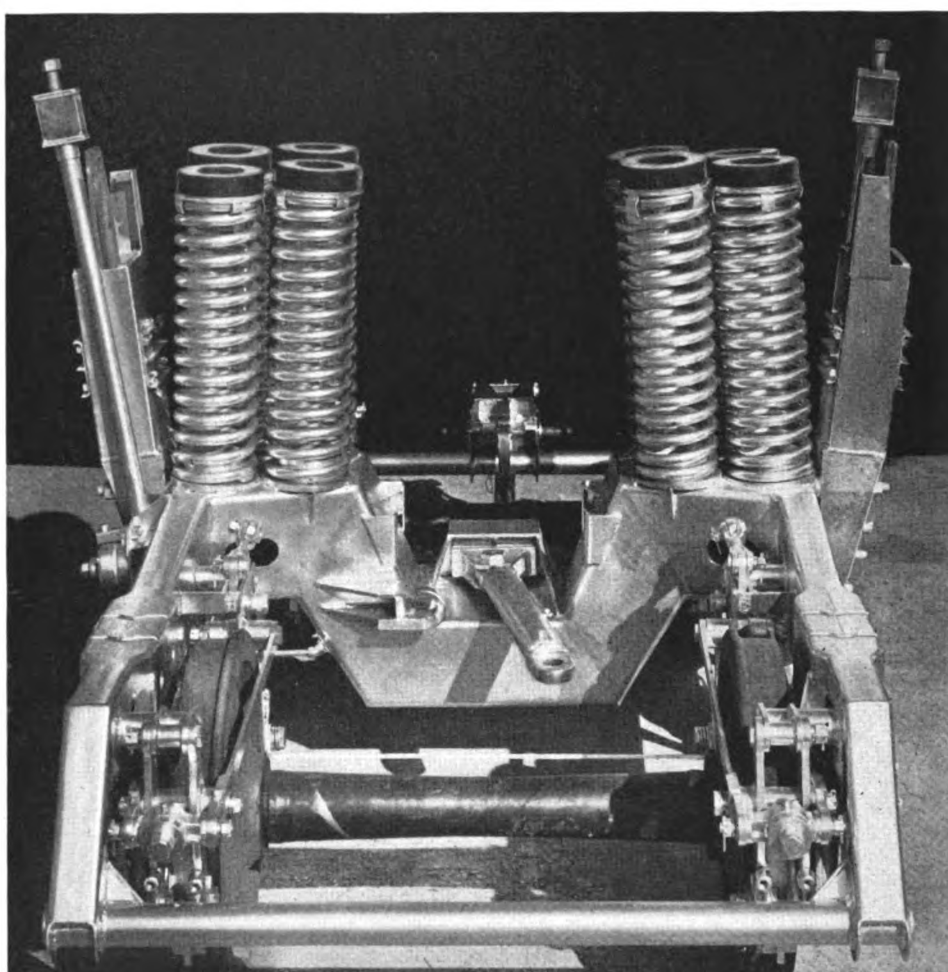
Heating equipment	Vapor Car Heating Co., Inc., Chicago.
Storage batteries	Electric Storage Battery Co., Philadelphia, Pa.
Battery receptacles	The Pyle-National Company, Chicago.
Switchboards, lavatory and vestibule lighting fixtures	Safety Car Heating & Lighting Co., Inc., New York.
Fluorescent bag-rack lighting fixtures, lavatory signs	C. W. Cole Company, Los Angeles, Calif.
Electrical receptacles	Cutler-Hammer, Inc., Los Angeles, Calif.
Electric cable	The Okonite Company, San Francisco, Calif.
Fuse receptacles and electrical train connections	Loeffelholz Company, Milwaukee, Wis.
Vibrator converters	Central Engineering Laboratories, Chicago.
Plywood for floors	Western Hardwood Lumber Co., Los Angeles, Calif.
Fibre wood for wall backing; Plymetl bulk-head panels	Haskelite Mfg. Corp., Chicago.
Armorply partition panels	United States Plywood Corp., Los Angeles, Calif.
Stainless-steel moldings	R. D. Werner Co., New York.
Aluminum extrusion and sheet for ceiling panels	Aluminum Co. of America, Los Angeles, Calif.
Vestibule and end doors	The Morton Mfg. Co., Chicago.
Door closers	P. & F. Corbin, New Britain, Conn.
Door hardware and hooks	H. S. Getty & Company, Philadelphia, Pa.
Door hardware	The Stanley Works, New Britain, Conn.
Door hinges	Loeffelholz Company, Milwaukee, Wis.
Door locks	Dayton Mfg. Co., Dayton, Ohio.
Door latches and holders; window curtains; ash receptacles; diaphragms	The Adams & Westlake Co., Elkhart, Ind.
Car seats	Transportation Seat Co., Mansfield, Ohio.

Other Features—Lighting and Air-Conditioning

The car floors are insulated with a combination of cork, Fiberglas and Airacoustic sound insulation. In the region of the trucks, where sound intensity is high, the exposed surfaces are made sound absorbent to reduce the sound level. The walls and roof are insulated with Fiberglas and Dednox.

The cars have attractive interior appointments and color schemes. They accommodate 56 to 68 passengers in rubber-cushioned, individually controlled reclining seats. The seat spacing is 44 in., or about 2½ in. longer than commonly used in modern chair cars, giving that much additional leg room.

The main passenger compartment in each car is illuminated by fluorescent lamps arranged in a continuous fixture located on each side of the aisle under the nose of the baggage racks. Individual light switches are installed at each seat adjacent to the light fixture. Two incandescent lamps, one white for general illumination and one blue for night lighting, are located in each of the five combination air-outlet and lighting fixtures in the ceiling. Incandescent lamps are used in the vestibule, dressing rooms, toilets and end aisles.

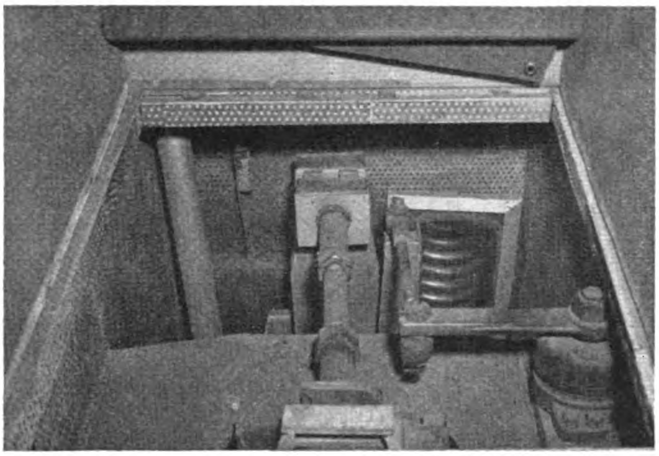


In lieu of a centerplate the longitudinal position of the truck is maintained by a thrust tube attached to the truck transom and the car body through rubber-cushion fittings

Upholstery	L. C. Chase & Co., Inc., New York.
Hoppers and lavatory plumbing fixtures	Dayton Mfg. Co., Dayton, Ohio.
Lavatory traps and piping; steam-heat, air and water piping	Crane Co., Los Angeles, Calif.
Electric water coolers	Tested Appliance Company, Chicago.
Paper-cup dispensers	Dixie-Vortex Co., Chicago.
Welding rod	The Lincoln Electric Co., Cleveland, Ohio.
Wrecking tools	Crear, Adams & Co., Chicago.
Fire extinguishers	Pyrene Mfg. Co., Newark, N. J.

NOTE:
SF—Atchison, Topeka & Santa Fe.
GN—Great Northern.
CB&Q—Chicago, Burlington & Quincy.

Electric power on the Santa Fe car is obtained from a Safety 10-kw. generator; body mounted on rubber insulators and driven by a flat belt from the truck axle. The Burlington car has a G. E. 20-kw. generator, driven by a Safety V-belt and gear drive. The generator is mounted longitudinally under the center sill in resilient mountings. The Great Northern car is similarly equipped with the exception of the generator which is a Safety

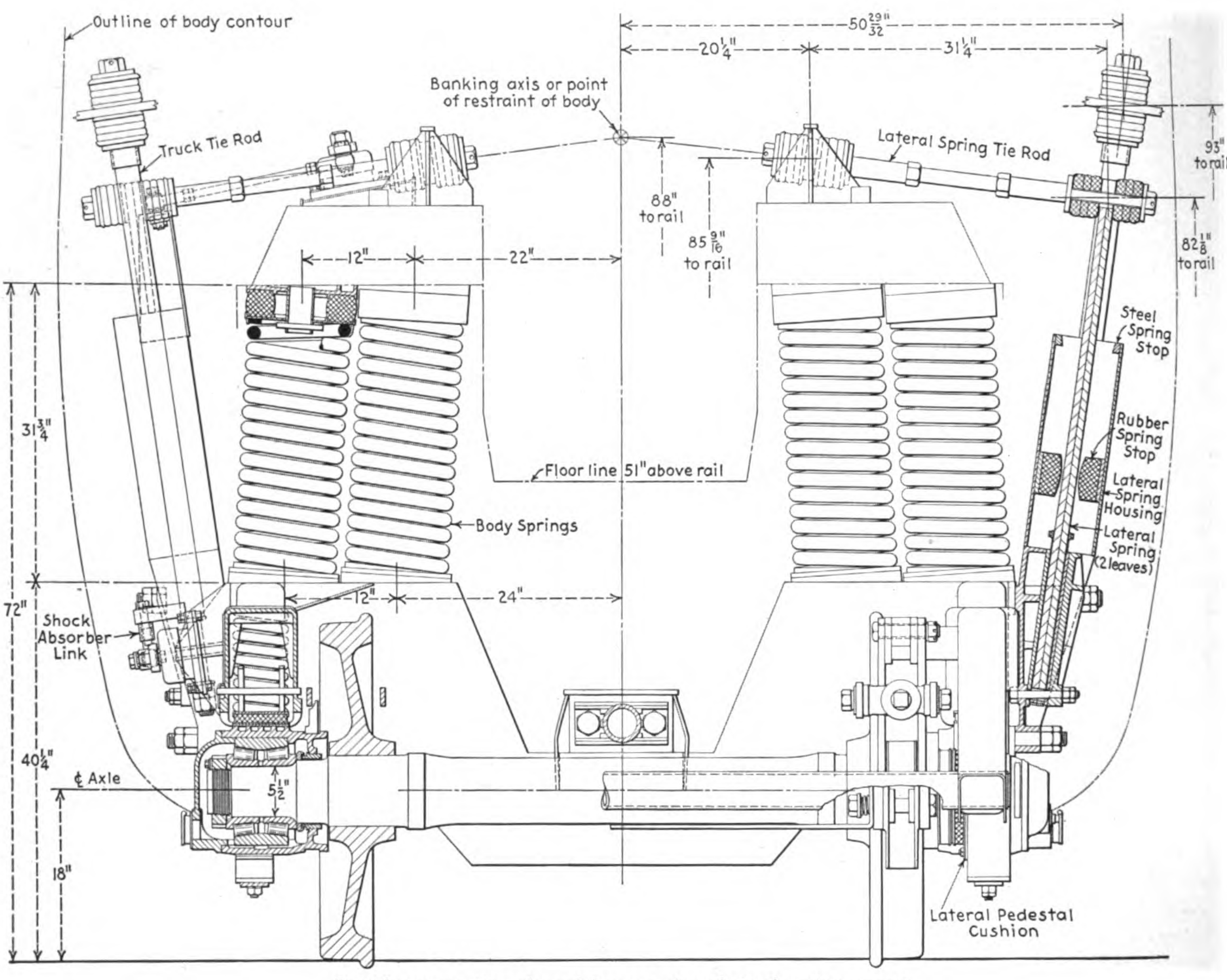


The upper end of the lateral swing controls over one of the trucks —A body support spring is reflected in mirror at right

ment to conform to that in general use on the owning road. The Santa Fe car has a Safety six-ton steam-ejector type air-cooling unit. The Burlington car is equipped with a Trane evaporative-condenser air-conditioning unit. A Frigidaire eight-ton air-conditioning unit is used on the Great Northern car. All three cars have overhead air distribution through Anemostats. Both floor and overhead heating is installed, with full thermostatic control.

Pendulum Cars Are Easy Riding

Demonstration runs indicate that the new pendulum cars are unusually quiet and that the riding qualities represent a distinct improvement over existing modern equipment. Although this type of car rides well when coupled to standard cars, the best riding qualities and full action of the pendulum suspension can be experienced only when the car is coupled between other cars of similar design. Since the banking of the pendulum car is opposite in direction to the roll of a standard car there is more relative movement and greater forces acting at the diaphragm when the pendulum car is coupled to a standard car than when coupled between other pendulum cars. While these forces restrict the pendulum action and tend to introduce some shock and vibration into the car, the generally excellent riding qualities are apparent to passengers comparing this car with other cars, even when the car is coupled between standard cars.



Partial cross-section of pendulum car through truck-spring support

20-kw. type. A Safety motor alternator, suspended beneath each car supplies 110-volt, a.c. current to the fluorescent lamps, razor and curling iron outlets.

Exide batteries are used in all three cars. D.c. charging receptacles are installed at each side of the cars and a.c. standby receptacles are available on the Burlington and Great Northern cars to permit operation of the air-conditioning equipment at stations and terminals.

Each of the three cars is air-conditioned with equip-

Frederick W. Hankins, D. SC.

Bucknell University was proud last June to adopt him as one of her sons

"FROM your boyhood days in England, without formal scientific education you have mastered the complexities of one of the most exacting responsibilities in modern industrial science. Step by step you have advanced by the hard way to the very pinnacle in the field of transportation. Administrator of a vast organization of men and machines, you have mastered your responsibilities through a rare combination of brains and character and energy and faithfulness. Bucknell is proud to put its seal upon you and your career and to call you hereafter one of her own sons." Such is the citation that was given when the degree of Doctor of Science was conferred upon Fred W. Hankins, assistant vice-president (operation) of the Pennsylvania Railroad, by Bucknell University at its Commencement exercises, June 9, 1941.

The awarding of such high scholastic honors to a railway mechanical department officer is most unusual. It is quite as extraordinary, also, for a man who has not been college trained, to reach such an exalted official position on the Pennsylvania Railroad. More than that, Mr. Hankins did not come up through Altoona, that great and revered center of training for Pennsylvania Railroad mechanical officers; nor, in fact, did he even start his railroad career on the Pennsylvania Railroad.

Why was Fred Hankins so honored? What sort of man is he? What peculiar traits and abilities have been responsible for his advancement to so prominent a position of authority and responsibility?

This is the second of three sketches of railway mechanical department officers who have been signally honored by colleges or universities. All three of them were awarded doctor's degrees last June. This is a most unusual occurrence. Why were these men so honored? Last month we published a story about George McCormick, general superintendent motive power of the Southern Pacific, who was given the degree of doctor of engineering by the Texas Agricultural and Mechanical College. Next month we will present an article on K. F. Nystrom, mechanical assistant to the chief operating officer of the Chicago, Milwaukee, St. Paul & Pacific, upon whom the degree of doctor of engineering was bestowed by Marquette University. These three men have quite different backgrounds. The routes over which they advanced to eminence differed quite as radically. As outstanding leaders, however, it would seem that they must possess some basic common characteristics. The studies were not prepared with this thought in mind; they were, in fact, made quite independently and reflect the characters and accomplishments of these men as seen by those with whom they have been intimately associated. To this extent the writer has functioned more as a reporter than as an evaluator.

Born in London

First, let us sketch in his background and the high spots in his career. He was born in London, England, on New Year's Day, 1876. His family came to the United States when he was two and a half years old. His uncle, a roving sort of chap, had been attracted to Pennsylvania when oil was first discovered, and induced Fred's father to follow him to this country. The wells were not drilled deep during the early stages of oil field development and the supplies of oil near the surface were soon depleted. The developers would then move on to new areas. This was disturbing to family life; moreover, Fred's mother was taken quite ill and for a couple of years he was sent to live in a German family, which had a son of about his own age. His father after a few years decided to give up the oil business and return to his trade as a baker. He built a home in the nearby town of Foxburg, Pa., designing and utilizing the front portion of it for a bakery.

Starts to Work at Fifteen

Fred went to school until he was about 15 years old. For a while he worked in his father's bakery and then in October, 1890, started to serve an apprenticeship with Fink & Zahnizer at Washington, Pa. This company manufactured drilling tools, such as bits, augur stems, etc., and conducted a general foundry business. Several months later, April 1, 1891, he went to work as a machinist apprentice at Foxburg, Pa., for the Pittsburgh & Western (now B. & O.), at that time a narrow gage line. From April, 1894, to July, 1897, he worked as a machinist on the Baltimore & Ohio at Allegheny, Pa. He entered the service of the Allegheny Valley (now P. R. R.) at Pittsburgh as a machinist in July, 1897.

For a few months in 1901, March 1 to June 30, he was acting enginehouse foreman at East Brady, Pa. He returned to Pittsburgh as a machinist, but on September 29 resigned to enter the service of the Spang-Chalfant Company of Pittsburgh. At the end of the year, how-

Frederick William Hankins

ever, December 30, 1901, he re-entered the service of the Pennsylvania Railroad at Pittsburgh as a machinist. From February 1, 1902, to May 8, 1902, he was acting enginehouse foreman at Pittsburgh. On December 9, 1902, he was appointed a leading machinist, which position he held until April 21, 1905, when he was transferred to the Cumberland Valley Railroad as enginehouse foreman at Chambersburg, Pa. He was made a foreman January 10, 1907, general foreman, January 1, 1910, and on the first of May, 1916, was promoted to master mechanic.

Attracts Attention of J. T. Wallis

During the period of the Railroad Administration in the World War, Master Mechanic Hankins' jurisdiction covered sections of three other roads in his district (the Western Maryland, Reading and the Baltimore & Ohio), in order to take advantage of the shortest and most direct routings. In a way he reported to three bosses. Apparently he did such a good job that in some way it attracted the attention of J. T. Wallis, at that time general superintendent motive power of the Pennsylvania Railroad, with headquarters at Altoona, and in January, 1919, he was transferred from the Cumberland Valley to Altoona for special work on the planning and arrangement of proposed new shop facilities at Marietta, Pa. These shops were never built, but the study and experience gained by Mr. Hankins at that time proved most useful in later years. Except for the manufacturing balconies, the general plan was followed in the building of the new Juniata erecting-machine shop at Altoona Works.

In March, 1920, when the railroads ceased to operate under the United States Railroad Administration, Mr. Hankins was made assistant chief of motive power, Pennsylvania System, assuming supervision over the condition of power for the entire system. In May, 1923, he was made general superintendent motive power of the Pennsylvania's Central Region, with headquarters at Pittsburgh. That region had been reduced by strike conditions to a point of efficiency none too high. This gave him an opportunity to demonstrate his ability, not only to handle a large organization, but to organize large operations and at the same time to build them up with meticulous care as to detail. It proved to be a "shirt sleeve job" for a couple of years, but as one of his associates expresses it, "it enabled him to find himself."

He was therefore well prepared when in February, 1927, he was made chief of motive power of the Pennsylvania System, with headquarters at Philadelphia.

Shop Facilities Drastically Revised

While Mr. Hankins is modest and not given to boasting, one cannot but feel in chatting with him that he takes a justifiable pride in the program for revamping the repair shop facilities which was inaugurated when he became chief of motive power. This undoubtedly played a large part in enabling the mechanical department of that great system to so successfully weather the long years of depression. His thorough, practical experience, the shop studies he made under Mr. Wallis, his responsibility for motive power conditions over the entire system, and the difficulties which he had to overcome in the Central Region, gave him an excellent background of experience for tackling this difficult and rather stupendous problem.

When he took over the job of chief of motive power the class repair work on steam locomotives was handled in ten shops, of which only two were modern and capable of handling economically the heavy steam power which had become a large part of the locomotive ownership at that time. His experience as general superintendent of motive power made him realize the difficulty of attempting to maintain heavy power in the smaller types of shops, and he therefore concentrated on four general aims:

1. To concentrate the locomotive repair work in large shops properly fitted to handle it.
2. To eliminate the small shops not properly equipped to take care of the big power.
3. To see that the shops retained were fitted with the necessary tools and equipment.
4. To provide the proper quality of supervision and craftsmanship at these shops, to insure that first-class work was done.

This was not an easy task; it required several years to accomplish it, and required much tact, judgment and knowledge both of shop location and equipment and of the operating personnel. It was undertaken during a period of very heavy business, but was completed in time to meet the conditions when the drop in business during the depression made it most essential that the locomotive equipment should be maintained in good condition by qualified personnel at the fewest number of places.

When the program was completed, the locomotive class repair work was concentrated in three modern shops properly equipped, instead of at ten shops of which only the larger were able to handle the heavy modern power.

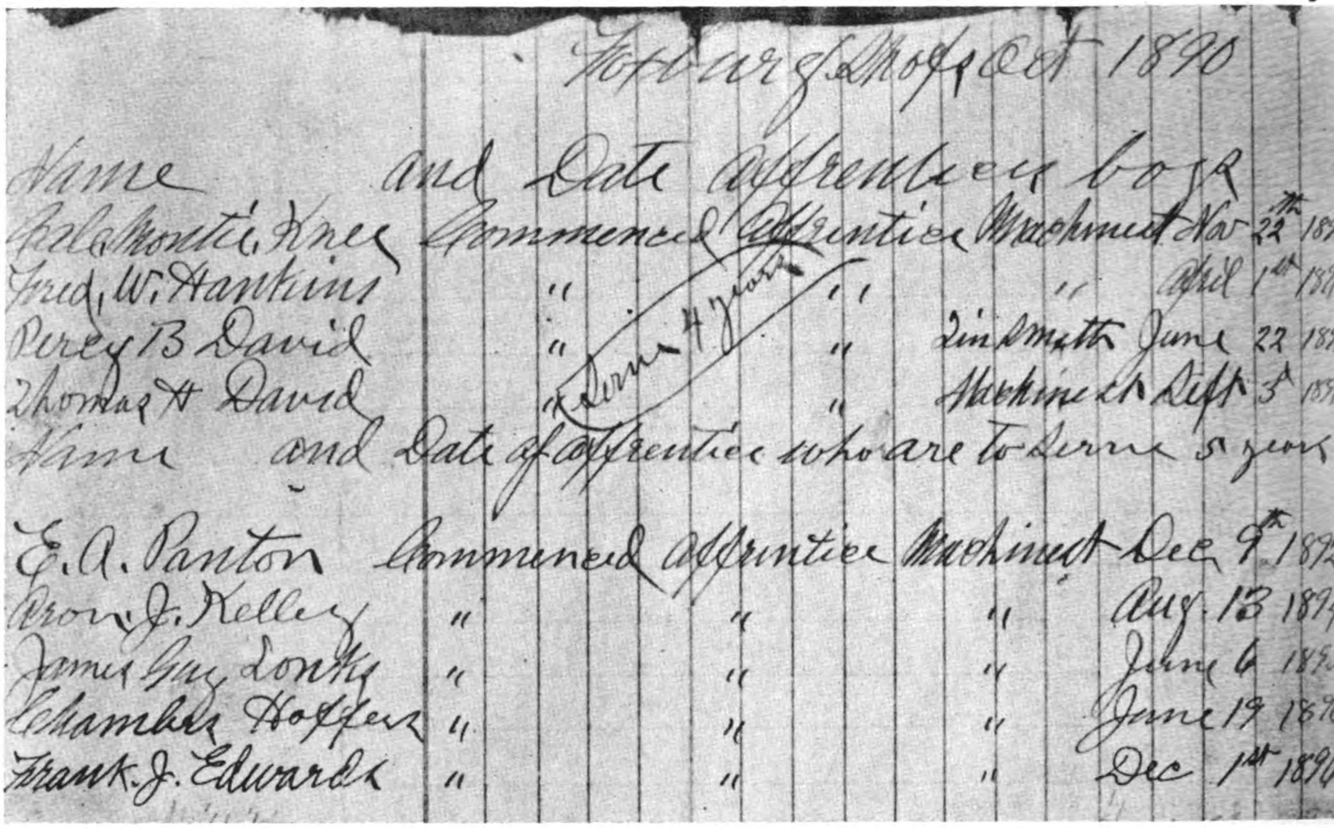
While Mr. Hankins was working on the co-ordination of the shop facilities to concentrate the locomotive class repair maintenance, he was carrying out a similar program in connection with class repair of passenger and freight cars. The points at which car work was done were reduced from 25 to 9, and this was largely accomplished through the fitting of these nine points with suitable equipment and personnel to do the repairs on a processing basis, thus increasing their efficiency and the volume of work that could be handled.

It should also be noted that as cars were run through these shops for class repairs they were thoroughly modernized.

Responsibilities Broadened

Titles are sometimes confusing when one attempts to trace the advancement or development of a railway officer. Reading between the lines, however, it is apparent that when Mr. Hankins assumed the position of general superintendent of motive power at Pittsburgh, he became a member of the regional cabinet, so to speak, and not only headed up the mechanical department of the region, but became deeply interested in and had a part in the total operations of the region, and particularly in relation to the selection and development of personnel. Certainly when he became chief of motive power of the entire system he must have become an important member of the inner council, else he might not have had the support that was required to bring about so radical a reorganization of the equipment maintenance facilities. This is evidenced to a degree, also, by the fact that in addition to his title of chief of motive power, he was appointed assistant vice-president in charge of operation on January 1, 1931. The title was changed to chief of motive power in June, 1932, but on January 1, 1936, he was appointed assistant vice-president—chief of motive power. On February 1, 1941, his title was changed to assistant vice-president (operation).

It will be recalled that it was during his administration that the eastern lines of the railroad were electrified and his general guidance and direction had much to do



Part of a page of an old apprentice record book of the Pittsburg & Western at the Foxburg, Pa., shops—Mr. Hankins' name is second from the top—Page rescued as the records were being burned

with the completion of the electrification program on schedule. In more recent years, also, with broader responsibiities in the operating department, he has had much to do with general transportation matters. He is credited with having performed an outstanding job during the great floods in Pennsylvania in 1936, in organizing men and materials at strategic points and assisting in the restoration of the service through the flooded areas in record-breaking time.

Related Activities

Naturally Mr. Hankins has taken a keen interest in the activities of the Mechanical Division of the Association of American Railroads. He has been a member of the General Committee of that Division for many years and served as its chairman, 1938-40. He was a delegate to the International Railway Congress at Madrid, Spain, in May, 1930.

In 1934 he was appointed by Joseph B. Eastman, at that time Federal Co-ordinator of Transportation, as a member of a committee to study and report on the mechanical problems affecting the railroads. This committee presented a thorough and voluminous report in December, 1935. It reviewed railway equipment and methods, and practices and standards relating thereto, from both an historical and a technical standpoint. As Mr. Eastman pointed out, "It contains a wealth of data which should prove of much value in current operations. In many instances it indicates strongly the necessity for continued investigation, and in certain specific fields it directly recommends such an investigation." One who was associated with Mr. Hankins on this project and also in the development of the standardization of freight car design, remarks that "a lasting debt is due to the fearless manner in which he at all times demanded that a definite decision be reached on every controversial question."

Mr. Hankins, in addition to his railroad duties, is now serving as vice-chairman, Advisory Committee, Division of Contract Distribution, Office of Production Management, for the State of Pennsylvania. This district has made an unusually good record and is said to be setting a pace in the effort to utilize small manufacturers and sub-contractors, in order to secure maximum production in the present emergency.

The Man Himself

So much for the route over which he has traveled and some of his broader accomplishments. How about the man himself? What follows is gleaned from or is a composite of expressions of a number of men who have been intimately associated with him, either in the official family of the railroad, or as representatives of government bureaus, labor and the railway supply industry.

First of all, he is distinguished by his sound common sense. A shrewd observer, of judicial temperament and an excellent judge of men, sizes him up in these words: "The outstanding characteristic in Fred Hankins, over and above his keen sense of humor, is a kindly, old-fashioned horse sense, which is almost a lost art nowadays, coupled with the greatest versatility. He reminds me whenever I am with him of David Harum." A fellow railroad officer points out that, "his power of analysis is very keen. He can almost instinctively make a correct estimate of a situation by his own observation and questioning, and come to a sound conclusion without being influenced by extraneous related facts and opinions. He has the most *uncommon amount of common sense* that you can generally find in a person."

An operating officer who has long been associated with Mr. Hankins emphasizes this same talent in a somewhat different way and in greater detail. "Perhaps," he says, "his most marked characteristic is an almost uncanny ability when attacking a job, to cut

through quickly to the heart of a matter, size up the essential element for sharp definition, and carry the work rapidly through to completion. His mind is never deterred or diverted from the main issue and he keeps at his task with tenacity and determination until it is a finished and well rounded achievement, complete in all its parts. He possesses to an unusual degree the attribute of good common, horse sense, and applies it with firm decision and dispatch. He is cool in action, adept in organization and administration, and gets things done. He is possessed of much creative and imaginative power, combined with the faculty for translating his thoughts and plans into prompt and decisive action."

A railroad executive in these days is called upon to make many investigations, including those of a highly controversial nature. One who has watched and studied him critically upon such occasions points out that, "when a case in which he is participating is under consideration he insists that all available facts be promptly assembled. When fully informed he decides without delay, yet I have never known him to withhold essential information or to take an unfair advantage of a colleague who might be in possession of less information, or has not had so much experience. When he makes up his mind he has positive views, which cannot easily be mistaken. He may be wrong, but I have never known him to be in doubt. He has the courage of his convictions. He stands by his guns. He does not let high powered salesmanship or politics influence his judgment."

Dealing with Highly Technical Matters

While Mr. Hankins did not attend school after he was 15 years of age and lacks a college technical training, his ability in handling engineering problems is highly regarded by engineers. He is a good picker of men and undoubtedly has the ability to seek out and enlist the best engineering advice. This is emphasized by a fellow officer of the railroad, who has had an excellent technical training and background, in these words: "He has the definite trait of being able to select as his officers those whose judgment is sound from a practical viewpoint on whatever technical subject he may be reviewing, to the end that when he comes to his own determination he has obtained a fair technical knowledge of the situation through his officers. This necessarily eliminates any tendencies to ride hobbies on any particular subject."

A man well known because of his outstanding ability as a mechanical engineer, and who has been thrown into rather intimate contact with Mr. Hankins over a score of years, states that, "Running through all his activities there is a noticeable order and precision. In matters of importance it is his method to listen to all sides and lead everyone to a logical, practical working agreement, maintaining the principle of progress and advancement at all times."

One of his associates on the railroad, a technically trained man, suggests that he has "a very thorough grasp of the fundamentals of engineering problems and has contributed considerable original thought on these subjects."

Builder of Men

Possibly the reader may already have gathered, reading between the lines, so to speak, that Fred Hankins to an outstanding extent, understands and knows how to deal with human nature. It is not altogether unlikely that this trait may have been developed, or at least greatly strengthened, by the fact that he was thrown so largely on his own resources in his boyhood days. Because of this ability he has for a long time been a considerable factor in selecting the official personnel on

Group from the Allegheny, Pa., roundhouse 1897—Mr. Hankins is center man in lower row

President Arnaud C. Marts of Bucknell University conferring the degree of Doctor of Science upon Frederick William Hankins—George T. Ladd of Pittsburgh, who presented Mr. Hankins for the degree, is in the background

the Pennsylvania. "A man without prejudice," says a P. R. R. executive, "he looks for the ability and the good in anyone and tries to develop the man. He is equally courageous in being able to tell a man, when he has gotten into a position beyond his capacity, that he should hunt something within his capacity and so find greater happiness."

Mr. Hankins has always taken a keen interest in the selection and training of the younger men, following them through the years, and counseling with them when they have had difficulties or needed advice. He has not hesitated to talk with them straight-from-the-shoulder, if that sort of approach seemed necessary. As one of his associates puts it, "I have known no one more able to give a man hell, make him like it, and profit by it."

He has recognized the importance of developing well qualified, all-around mechanics and to this end has used his influence to see that the apprentices were moved from job to job, according to schedule. Special apprentices have profited from the fact that he has given them every opportunity to secure a broad experience and to prevent them from getting into routine work and blind alleys. It is doubtful if the men themselves have got any more satisfaction out of their advancement or promotion than has Mr. Hankins. In a real way he has been a "builder of men."

One of his associates sums up this special ability thus: "One of Mr. Hankins' outstanding characteristics is his keen sense of human values. He can quickly appraise men, is equally capable in directing their efforts, inspiring them to do their best, and in applying discipline when necessary, at the same time retaining their loyalty and affection. I am confident that one of the greatest satisfactions of his railroad career has been his intense interest in developing men, determining by careful observation the work for which they are best fitted and guiding them to jobs in which their talents and abilities find full expression."

In the training of men under him he is most helpful in giving them direction and help where help is needed. There is a story that an important staff officer came into his office one day and said he was terribly worried about a certain matter. Mr. Hankins immediately replied, "That will be all right, I will do the worrying and you do the work; as a matter of fact, I have just organized a Worry Department and I am referring all worries to them, and at the present time they are not busy and can take on your troubles." This casual remark spread to a good many in his organization and relieved them of wasting their time worrying about things not essential.

His fairness to others, who may in his judgment be treated unfairly, is well recognized and, conversely, his uncanny ability to detect delinquencies and failures in others has been the cause of correcting conditions in personnel or management which have led to his success.

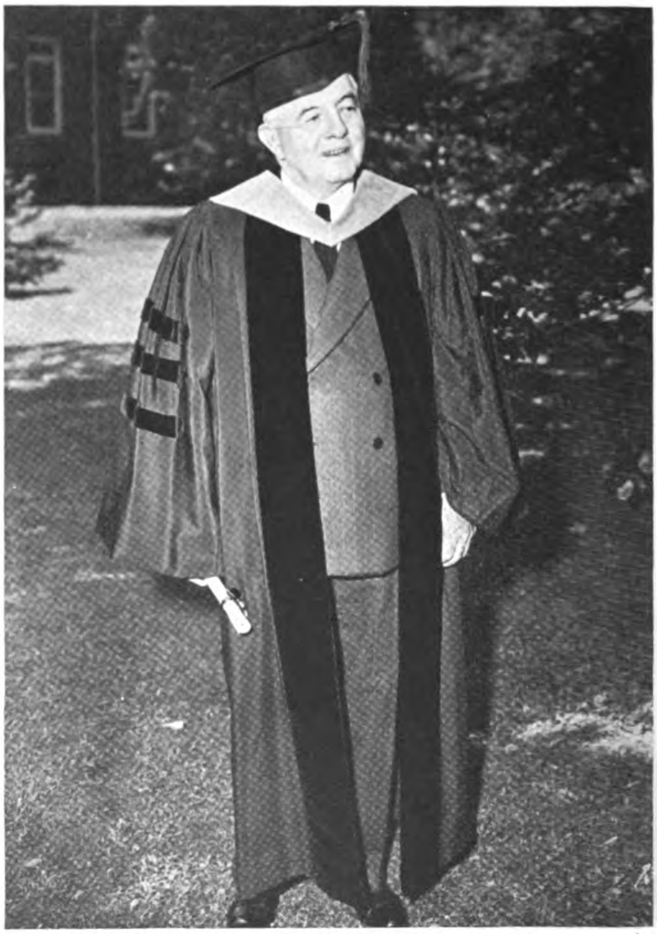
A Disciplinarian

Mr. Hankins has the reputation of being a strict disciplinarian. But, on the other hand, an operating officer who has been closely associated with him, says: "I defy any man to travel the length of this railroad and find one individual who is not working every day for him, regardless of the fact that he is strict; and regardless of the number of hours it takes they are glad for the opportunity of doing the job well for one who is held in the highest esteem, from the fellow who pushes a wheelbarrow to the highest boss in the shop."

He has a keen sense of humor and it is said that he has the happy faculty of making people feel comfortable, even though he may be applying very strict discipline; or uncomfortable, as the necessity may warrant.

Ability to Adjust Himself

Reports one of Mr. Hankins' friends: "When he went to the Cumberland Valley, he made himself one of the people there. It is a land of homes; and he owned homes. It is a land of orchards, both apple and peach; and with his friends of the Valley he developed orchards,



"Doctor Hankins"

both apple and peach. He became a part of the community.

"When he was raised to high position he adjusted himself in his contacts to the business men with whom he had to associate, and he became popular with all of those with whom he associated. In business he has the happy faculty of adjusting himself to other men's viewpoints."

Loyalty to Friends

"He is remarkable,"reports an associate, "for his ability to retain old friendships as he advances through the railroad organization; it makes little difference to him whether a man is a car inspector or a vice-president; if he knows, or has known him, he likes him as much as a friend, no matter what his position, and this characteristic has enabled him to retain the respect and friendship of all classes of people, as he himself has advanced in position and responsibility."

"He is still as easy to approach as the humblest roundhouse foreman on the railroad," suggests one of his friends. "As an instance of this, shortly after he was promoted to chief of motive power he was making an inspection in a large locomotive repair shop, accompanied by the shop superintendent and other local officials. While passing a locomotive on which the boiler was stripped and being repaired, a workman saluted him from above, calling, 'Hello, Fred.' Mr. Hankins stopped and looked up at the boiler; he did not immediately recognize the workman, but called him to come down to the floor. 'I am so and so, I worked for you as a boilermaker years ago,' said the workman. This was sufficient to refresh Fred's mind; he grasped the greasy hand of the workman and gave him a very cordial handshake."

His Hobbies

There is no question about Fred Hankins' hobbies, although one of them is part of his vocation. We have already commented upon his interest in "building men." Ever since he achieved a supervisory position he has been a hunter for promising material and then in testing it out. He has tried to discover and inspire men who otherwise might go through life without having their abilities recognized and utilized. More and more he has been impressed by the fact that in a large organization someone must take the trouble of picking out, testing out and following through with promising material. It is a large task; it necessitates adequate personnel records and check-ups, and an intimate contact with and knowledge of the men on the job. It can't be done by sitting in a swivel chair at headquarters.

His other hobby is fishing. One of his cronies comments thus: "Fred Hankins is a great fisherman, who would and does ride 200 miles at night to grab a few trout and bass out of a stream the next morning, and then start back at noon. He has more fishing paraphernalia than any two men ought to have, but professes to have it because his friends, who know so much less about fishing, would be 'hamstrung' if he did not have the wherewithal."

Mr. Hankins is a member of the Masonic Lodges and of the Episcopal Church. At the annual meeting of the Alpha Phi Chapter of Kappa Sigma Fraternity, held at Bucknell University last June, he was elected an honorary member of the Chapter.

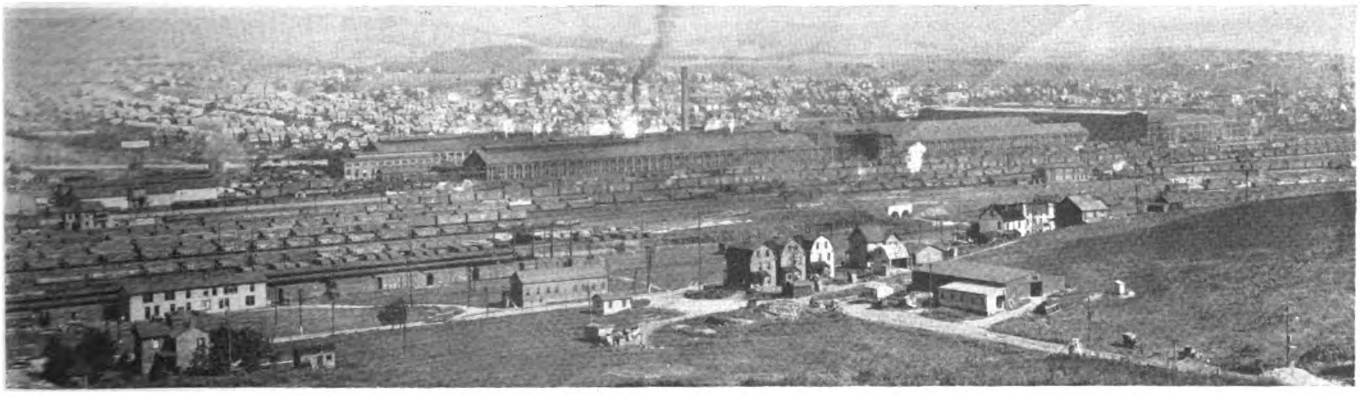
In Conclusion

The Pennsylvania Railroad, possibly more than any other American railroad, has had the reputation of being officered by technically trained men. A mechanical department officer, a graduate of Yale and trained at Altoona, became one of its outstanding presidents; moreover, that president, William Wallace Atterbury, served with distinction during the First World War as director-general of transportation of the A. E. F. and was commissioned a brigadier general.

Fred Hankins, with hardly a common school education, has achieved a high official position on that system, coming up through the mechanical department—a highly technical branch of the service.

Until the early part of the present century an engineer was defined as one who was expert in dealing with and utilizing materials and forces of nature. Then came Fred Taylor and the so-called scientific management experts. They pioneered the way in emphasizing the importance of the human factor in engineering and industrial operations, and the definition of the engineer was broadened to include responsibility for utilizing and directing of the human element in industry.

In Fred Hankins we have an example of a man who has an unusual understanding and appreciation of the importance of the human element in railroad operations. Handicapped by a lack of a college technical education he may possibly have been, but few college trained men have achieved so great a success in the railroad mechanical department. His natural ability to get along with people, plus his keen observation and thorough practical experience, has made it possible for him to select and train men, college educated and otherwise, and to utilize them effectively in the administration of a great technical organization. His success emphasizes the vital importance of mechanical department officers studying to improve their ability to deal with and wisely direct the human element in their organizations.



Bird's-eye view of a portion of the Altoona Works of the Pennsylvania

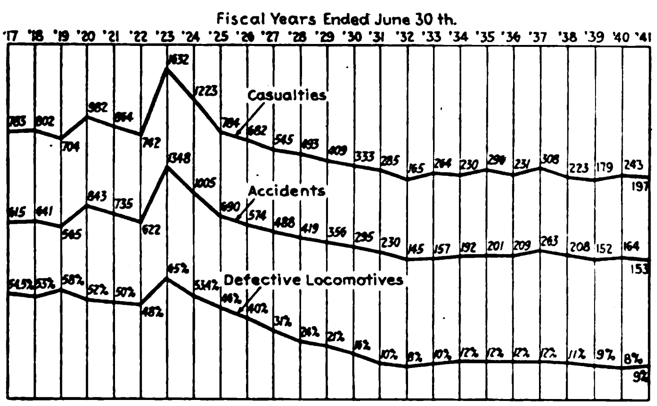
Bureau Annual Report Shows That

Locomotive Defects Increase

The number of accidents, persons killed and injured shows substantial decrease—Director Hall cautions against danger and waste from temporary repairs

THERE were 153 accidents in connection with steam locomotives, resulting in 15 deaths and 182 injuries during the fiscal year ended June 30, 1941, according to the annual report of John M. Hall, director, Bureau of Locomotive Inspection, Interstate Commerce Commission. This represents a decrease from the preceding year of 11 accidents, of 3 in the number of persons killed, and of 43 in the number of persons injured. The tables show that 9 per cent of the locomotives inspected were found defective, an increase of 1 per cent; that the number of locomotives ordered withheld from service because of defects that rendered the locomotives immediately unsafe increased by 15 per cent. There was also an increase of 15 per cent in the total number of defects.

Of the total of 153 accidents, 43 were caused by the failure of some part or appurtenance of the steam locomotive boiler, resulting in the loss of 12 lives and injuries to 64 persons. This is a distinct improvement over 1940 when there were 67 accidents related to steam locomotive boiler failures which caused the loss of 16 lives and injuries to 110 persons.



Relation between defective steam locomotives, accidents and casualties resulting from locomotive failures during 25 years

In a table showing the various parts and appurtenances of steam locomotives and tenders, failures of which have caused serious or fatal accidents, failures of nine groups other than crown-sheet failures are each the cause of five or more injuries. In the order of the number of casualties, these are: reverse gears; hand-holds; fire doors, levers, etc.; springs and spring rigging; brakes and brake rigging; flues; boiler checks; throttle rigging, and trucks, leading, trailer or tender. Only two groups have shown a consistently bad record throughout the five years covered in the table. These are reverse gears, with 11 accidents and 12 injuries in 1941, and handholds, with 11 accidents and 11 injuries during the same year.

Tables in the report also record 11 accidents caused by failure of some part or appurtenance of locomotives other than steam, in which 11 persons were injured, five of whom were firemen, two maintenance employees and one each of the following: engineman, brakeman, conductor and nonemployee. Four of the 11 casualties were the result of fires due to overflowing or leakage of fuel, crank-case explosions, back firing, etc. The other casualties were from a variety of causes.

The report includes in tabular form a complete analysis of the number of locomotives inspected, the defects found, and the number ordered from service on each railroad. Tables showing the summaries of the number of defects found on all of the railroads are here shown.

Explosions and Other Boiler Accidents

All of the 11 explosions that occurred in the fiscal year, in which 11 persons were killed and 29 injured, were caused by overheating of the crown sheets due to low water. There was a reduction of one in the number of persons killed and an increase of 14 in the number of persons injured from this cause as compared with 1940.

Four of the explosions were particularly violent; one

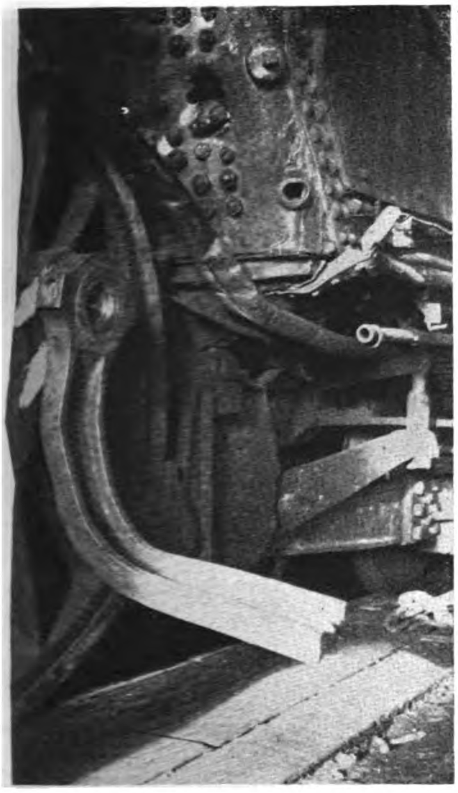
Number of Casualties Classified According to Occupation—Steam Locomotive Accidents

	Year ended June 30											
	1941		1940		1939		1938		1937		1936	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:												
Engineers	5	41	5	70	4	46	3	70	8	106	4	75
Firemen	5	68	6	49	6	66	2	80	5	78	6	72
Brakemen	3	21	4	24	2	18	..	31	3	30	3	28
Conductors	..	8	1	4	..	5	..	6	1	18	..	13
Switchmen	..	6	..	4	..	6	..	7	..	10	..	2
Roundhouse and shop employees:												
Boilermakers	..	..	1	3	1	1	..	2	2	2	..	..
Machinists	1	3	..	3	..	2	..	..	..	2	..	4
Foremen	..	2	..	..	..	..	..	1	..	..	..	3
Inspectors	..	..	..	..	..	..	..	1	..	..	..	2
Watchmen	1	2	..	1	..	1	2	..	1	1	1	1
Boiler washers	..	..	..	..	..	..	..	1	..	..	..	..
Hostlers	..	3	..	2	..	1	..	6	..	9	..	3
Other roundhouse and shop employees	..	1	..	1	..	2	..	1	..	3	..	3
Other employees	..	9	1	20	..	2	..	3	1	14	..	5
Nonemployees	..	18	..	44	2	14	..	7	4	10	2	4
Total	15	182	18	225	15	164	7	216	25	283	16	215

of these accidents occurred while the locomotive was hauling a passenger train at an estimated speed of 50 to 55 m.p.h. Two employees were killed and one employee and five Pullman employees were injured. The force of the explosion tore the boiler from the running gear and hurled it forward 330 ft. where it struck the track, rebounded and again struck the track and came to rest on its right side, in reverse position, near the east side of the track. The running gear, tender, and first four cars were derailed where the boiler first struck, and the track was torn up from this point for a distance of 350 ft. Parts of the wreckage were scattered in various directions up to 725 ft. from the point of explosion.

In another accident, in which no fatalities occurred but in which 10 employees and three nonemployees were injured, the explosion occurred about 38 minutes after arrival at a station while the locomotive and empty passenger train were being moved, together with another locomotive and its empty passenger train, from the final terminal station for the passenger train to the yard and enginehouse. The force of the explosion tore the boiler from the running gear and hurled it upward and partly over the other locomotive to which it was coupled. In its descent the boiler struck the back edge of the cab of the other locomotive and landed on top of the tender and a baggage car immediately to the rear, then rolled to the ground and came to rest upside down on the adjacent tracks about 154 ft. from the point of explosion.

Three employees were killed in another explosion while the locomotive was hauling a freight train at an

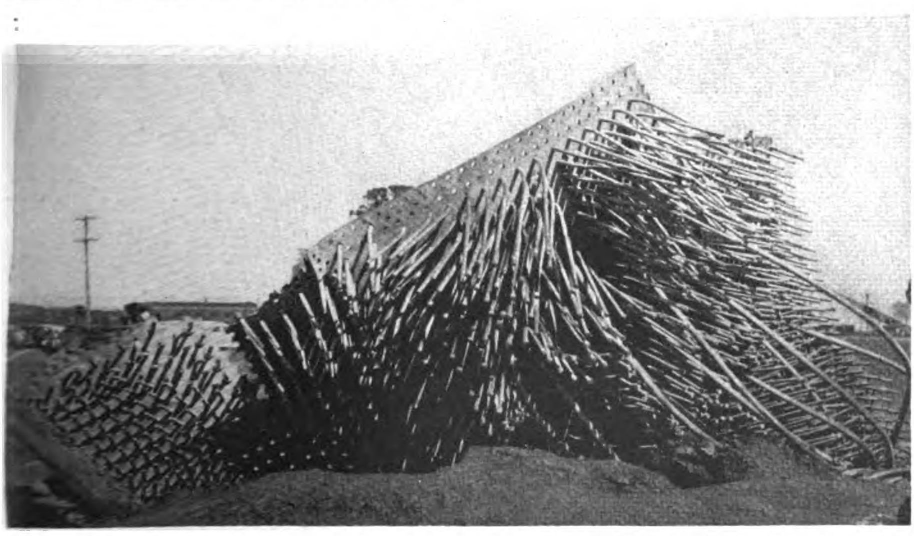


▲ Fig. 1

◀ Fig. 2

Fig. 3 ▶

Fig. 4 ▼



Figs. 1 and 4—The results of an explosion caused by overheated crown sheet due to low water in which four employees were killed and one was injured—Parts of the firebox wrapper sheets and stays, weighing between 14,000 and 16,000 lb., are shown in Fig. 4—The remainder of the firebox and boiler are shown in Fig. 1

Figs. 2 and 3—The result of a broken side rod which failed while the locomotive was hauling a passenger train at an estimated speed of 60 m. p. h.—The rod punctured the outside and inside throat sheets and steam and hot water escaped around and into the cab—Two employees were killed

estimated speed of 8 m.p.h. The force of the explosion tore the firebox casing sheets and mud ring, together with stays, braces, and various appurtenances, from the cyindrical part of the boiler. These parts were hurled forward 347 ft. and came to rest on the track, where they were struck by the front or low-pressure engine which had become separated from the rear frame due to breakage of the articulating casting. The cylindrical part of the boiler was torn from the rear engine, the running gear of which stopped 72 ft. from the point of explosion. This part of the boiler, with torn firebox sheets attached to the inside throat sheet, was hurled forward 196 ft., where it alighted on the track, then skidded and came to rest on the north side of the track, 235 ft. from the point of explosion, with attached parts of the firebox sheets extending across the track.

In another explosion, in which four employees were killed and one nonemployee was injured, the force of the explosion tore the boiler from the running gear and it alighted on the outer rail of an adjacent siding, then rolled to the left and came to rest in an upright position 107 ft. ahead and 40 ft. to the left of the point of explosion. Parts of the back end or firebox casing sheets were blown off, and the part of the crown sheet to the rear of the combustion chamber, with the entire right firebox side sheet, a major portion of the left side sheet, and two small portions of the door sheet were blown out and ahead 491 ft. and came to rest on the main track, where these parts were struck by the running gear. Parts of the wreckage were blown for distances up to 562 ft. from the point of explosion.

Two employees were killed and nine employees were injured in the remaining seven accidents in which the explosions were less violent than those described.

Boiler and appurtenance accidents other than explosions resulted in the death of 1 person and injuries to 35 persons; this is a reduction of 3 deaths and 60 injuries as compared with the preceding year.

Boiler-Feeding and Water-Level-Indicating Devices

Our investigations of two of the explosions revealed serious neglect in not maintaining the boiler-feeding devices in condition to perform their intended function. Repeated reports of impairment of capacity of these devices had been made over considerable periods of time prior to the explosions. All of these reports were signed for purporting to show that work had been done on the parts reported but later reports showed that the defective conditions continued until the explosions occurred. Repeated reports on the same defective condition should be sufficient warning that proper repairs had not been made and demonstrate the necessity of making such inspections and tests after repairs have been attempted, that will show whether their purpose has been accomplished.

Serious neglect is also evident in some instances in the matter of maintaining water-level-indicating devices in good condition, which includes thorough cleaning of gage cocks, water glass cocks, and water-column connections each time the boilers are washed, or more frequently if needed to prevent stoppages or partial stoppages of the water and steam passages, inspections and repairs sufficiently often and thorough to insure that these devices operate and indicate as intended, and the condition and proper placement of water glass lamps.

Extension of Time for Removal of Flues

One thousand one hundred and eighty-two applications were filed for extensions of time for removal of flues, as provided in rule 10. Our investigations disclosed that in 98 of these cases the condition of the locomotives was such that extensions could not properly be granted. Nineteen were in such condition that

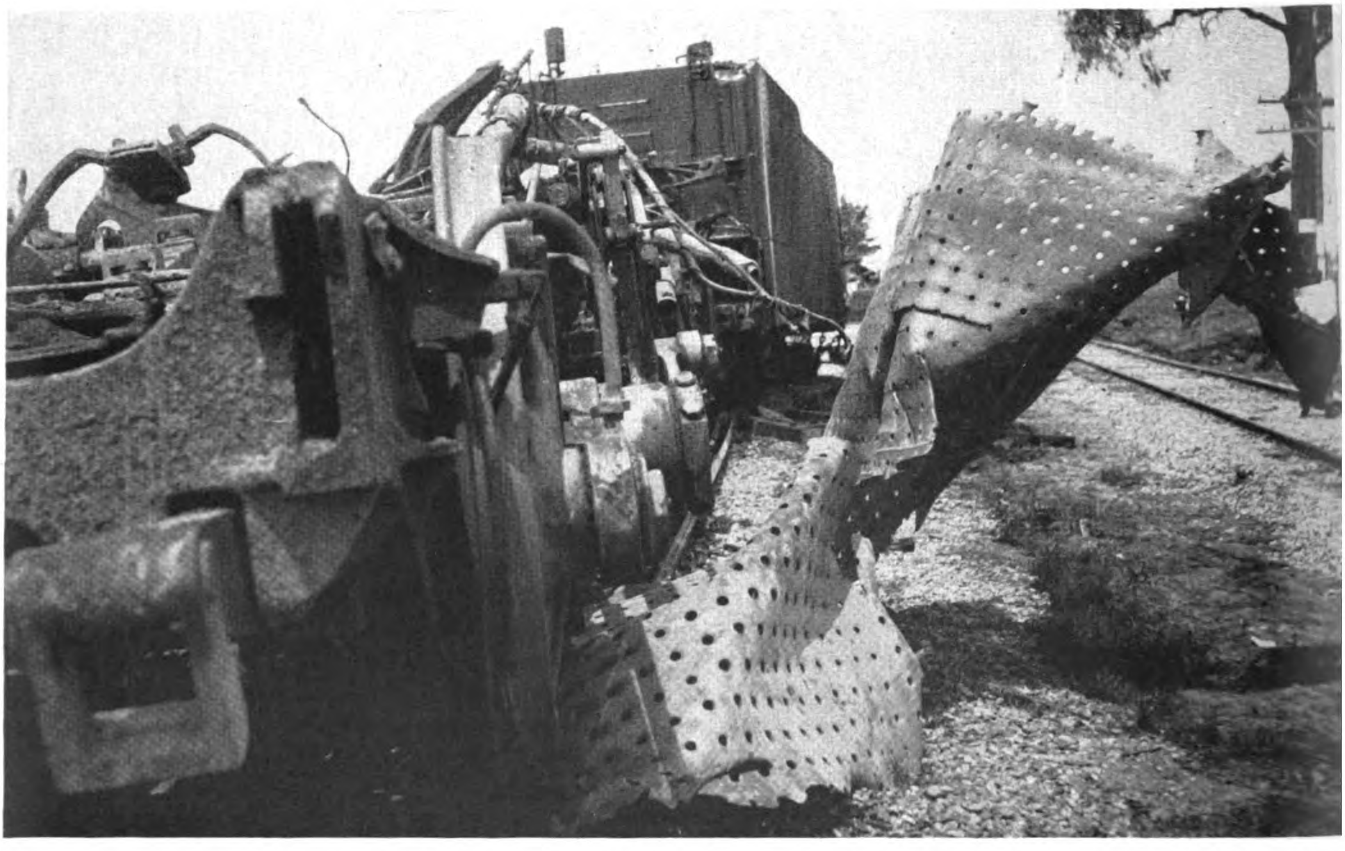


Fig. 5—The running gear and tender after the boiler explosion shown in Figs. 1 and 4—The front driving wheel of the rear unit of the 4-8-8-; type cab-ahead locomotive is resting on part of the crown sheet which came to rest on the track 491 ft. in front of the point of explosio

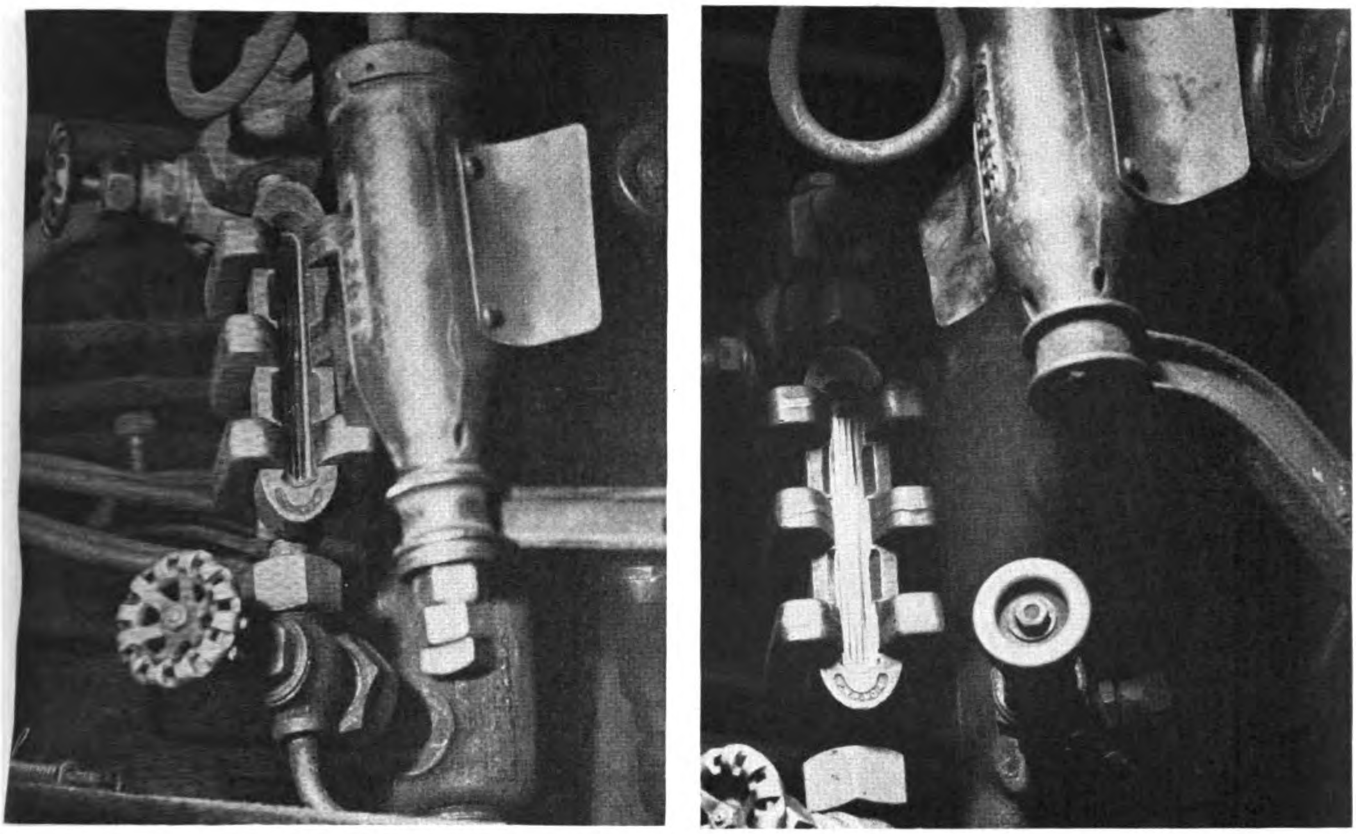


Fig. 6—A reflex type water gage (left) illuminated from the lamp in the cage has the appearance of carrying a full glass of water—After the light source was adjusted (right) the absence of water in the gage is clearly shown—The report carries the following comment:

If crown-sheet accidents due to misreading of the water level are to be avoided, it is necessary that proper attention be given to the lighting of water gages, the condition of the corrugations in reflex glasses, cleanliness of water glasses, and the condition of water and steam passages in water gages and connections, including water columns.

the full extensions requested could not be authorized, but extensions for shorter periods of time were allowed. Seventy-two extensions were granted after defects disclosed by our investigations were required to be repaired. Twenty-nine applications were canceled for various reasons; 964 were granted for the full period.

Number of Steam Locomotives Reported, Inspected, Found Defective, and Ordered from Service

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30					
	1941	1940	1939	1938	1937	1936
Air compressors	684	567	518	689	766	740
Arch tubes	31	20	28	66	105	74
Ashpans and mechanism	67	37	67	72	80	79
Axles	5	3	2	13	10	13
Blow-off cocks	205	191	204	226	199	236
Boiler checks	313	288	279	301	382	356
Boiler shell	271	266	272	331	347	383
Brake equipment	1,945	1,506	1,577	2,044	2,322	2,480
Cabs, cab windows, and curtains	1,087	1,078	943	1,226	1,807	1,638
Cab aprons and decks	307	277	260	326	466	450
Cab cards	97	101	92	109	145	166
Coupling and uncoupling devices	74	53	60	73	74	65
Crossheads, guides, pistons, and piston rods	858	815	739	905	1,160	1,056
Crown bolts	97	54	47	59	76	63
Cylinders, saddles, and steam chests	1,332	1,320	1,232	1,645	2,206	1,717
Cylinder cocks and rigging	438	447	418	585	729	605
Domes and dome caps	94	78	90	109	101	114
Draft gear	620	508	450	740	522	513
Draw gear	347	306	360	479	560	451
Driving boxes, shoes, wedges, pedestals, and braces	1,348	1,243	1,330	1,688	1,637	1,712
Firebox sheets	224	191	238	244	371	295
Flues	150	147	165	159	225	178
Frames, tail pieces, and braces, locomotive	863	665	708	1,001	1,053	997
Frames, tender	83	78	71	131	120	113
Gages and gage fittings, air	183	132	155	230	261	257
Gages and gage fittings, steam	236	211	226	279	324	350
Gage cocks	373	400	361	451	538	579
Grate shakers and fire doors	430	273	252	403	470	400
Handholds	433	333	349	405	510	502
Injectors, inoperative	39	30	26	26	38	40
Injectors and connections	1,882	1,330	1,457	1,784	2,020	2,085
Inspections and tests not made as required	7,215	6,218	6,645	8,204	9,638	9,005
Lateral motion	357	313	243	325	446	404
Lights, cab and classification	50	49	50	48	90	78
Lights, headlight	190	180	177	257	313	251
Lubricators and shields	196	185	200	212	254	255
Mud rings	187	213	248	203	272	237
Packing nuts	508	418	408	448	487	508
Packing, piston rod and valve stem	675	660	739	913	1,393	1,133
Pilots and pilot beams	142	140	104	154	133	178
Plugs and studs	156	156	179	238	238	236
Reversing gear	387	320	317	404	492	463
Rods, main and side, crank pins, and collars	1,565	1,199	1,293	1,669	2,348	2,093
Safety valves	68	61	97	125	132	125
Sanders	490	415	432	536	655	678
Springs and spring rigging	2,597	2,174	2,340	2,901	3,172	3,008
Squirt hose	62	50	75	94	133	134
Stay bolts	239	227	181	211	276	279
Stay bolts, broken	198	271	258	380	542	520
Steam pipes	385	255	285	410	446	526
Steam valves	110	106	115	141	165	227
Steps	555	449	490	631	678	615
Tanks and tank valves	952	768	837	955	1,009	877
Telltale holes	59	95	58	67	79	127
Throttle and throttle rigging	688	647	638	685	909	760
Trucks, engine and trailing	636	598	628	762	785	861
Trucks, tender	773	705	665	907	1,018	1,108
Valve motion	580	506	554	722	798	824
Washout plugs	445	478	487	626	598	714
Train-control equipment	1	2	5	11	12	6
Water glasses, fittings, and shields	788	753	690	915	1,049	1,118
Wheels	536	554	466	577	803	790
Miscellaneous—Signal appliances, badge plates, brakes (hand)	785	564	610	684	759	608
Total number of defects	37,691	32,677	33,490	42.214	49,746	47,453
Locomotives reported	43,236	44,274	45,965	47,397	48,025	49,322
Locomotives inspected	105,675	102,164	105,606	105,186	100.033	97,329
Locomotives defective	9,570	8,565	9,099	11,050	12,402	11,526
Percentage inspected found defective	9	8	9	11	12	12
Locomotives ordered out of service	560	487	468	679	934	852

Locomotives Propelled by Power Other Than Steam

There was an increase of four in the number of accidents occurring in connection with locomotives other than steam and an increase of four in the number of persons injured as compared with the preceding year. No deaths occurred in either year.

During the year six per cent of the locomotives inspected by our inspectors were found with defects or errors in inspection that should have been corrected before the locomotives were put into use; this percentage is the same as in the preceding year. There was an increase of five in the number of locomotives ordered withheld from service because of defects that rendered the locomotives immediately unsafe.

Specification Cards and Alteration Reports

Under rule 54 of the Rules and Instructions for Inspection and Testing of Steam Locomotives, 225 specification cards and 6,786 alteration reports were filed, checked and analyzed. Corrective measures were taken with respect to numerous discrepancies found.

Under rules 328 and 329 of the Rules and Instructions for Inspection and Testing of Locomotives Other Than Steam, 447 specifications and 39 alteration reports were filed for locomotive units and 100 specifications and 91 alteration reports were filed for boilers mounted on locomotives other than steam. These were checked and analyzed and corrective measures were taken with respect to discrepancies found.

Legal Action

Based upon investigations made by the Bureau, one case of violation of the rules and instructions for inspection and testing of steam locomotives and tenders and their appurtenances, comprising 17 counts, was transmitted to a United States attorney for prosecution. This case is now pending in the district court.

No formal appeal by any carrier was taken from the decisions of any inspector during the year.

Locomotives and Accident Prevention

Vast strides have been made in improving the general condition of locomotives since 1924 due to increased funds available to the Bureau and a realization on the part of the railroads that more effective use can be made of locomotives maintained in condition to comply with the established rules and instructions. The percentage of locomotives found defective in the fiscal year ended June 30, 1940, reached a low of 8 per cent, and this percentage increased to 9 per cent in the fiscal year ended June 30, 1941. This represents one per cent recession in the condition in the fiscal year ended June 30, 1941, as compared with the preceding year. There was a material increase in the total number of defects found and reported by our inspectors as compared with the preceding year, and there was an increase of 15 per cent in the number of steam locomotives ordered from service.

Under ordinary conditions these results need not necessarily be particularly alarming since some variations can be expected from year to year; however, under present circumstances special significance is necessarily attached thereto because of the shortage of material and skilled labor. All possible measures should be taken to increase the thoroughness of inspections and to apply timely and substantial repairs.

The practice, still too often indulged in, of applying temporary repairs in the hope that the locomotive will make a successful trip and that more adequate repairs may be applied thereafter when the time is most convenient, has been productive of many failures on the line

Fig. 7—Injector steam-valve body and bonnet which blew out without warning, resulting in injury to one employee—The threads on the bonnet, applied the day before the accident, were found to be worn off about 1/32 in. and the fit in the valve body was enlarged, the threads apparently not engaging to any extent—When inverted, the bonnet would drop out

Number of Locomotives Other Than Steam Reported, Inspected, Found Defective, and Ordered from Service

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30					
	1941	1940	1939	1938	1937	1936
Air compressors	22	8	14	6	6	2
Axles, truck and driving	5	..	1	5	4	6
Batteries	6	1	1	1	4	..
Boilers	4	10	6	6	5	5
Brake equipment	69	50	50	74	97	66
Cabs and cab windows	45	22	36	25	51	30
Cab cards	24	13	18	11	25	..
Cab floors, aprons, and deck plates	14	17	13	8	17	10
Controllers, relays, circuit breakers, magnet valves, and switch groups	7	16	13	7	8	..
Coupling and uncoupling devices	2	6	4	4	3	..
Current-collecting apparatus	3	1	5	8	4	16
Draft gear	15	31	17	23	28	24
Draw gear	3	2	4	3	1	1
Driving boxes, shoes, and wedges	36	29	52	16	14	5
Frames or frame braces	1	12	9	37	5	15
Fuel system	62	51	35	47	152	44
Gages or fittings, air	3	1	6	11	1	6
Gages or fittings, steam	..	2	..	..	..	..
Gears and pinions	2	1	2	2	2	..
Handholds	12	6	8	13	11	8
Inspections and tests not made as required	243	207	185	204	237	186
Insulation and safety devices	4	2	4	13	13	20
Internal-combustion engine defects, parts and appliances	54	35	32	26	50	23
Jack shafts	3	7	6	1	..	1
Jumpers and cable connectors	..	..	1	1	2	..
Lateral motion, wheels	4	5	1	..	1	2
Lights, cab and classification	2	1	3	2	5	6
Lights, headlight	1	3	4	4	11	4
Meters, volt and ampere	..	4	2	2	1	2
Motors and generators	16	12	19	18	10	14
Pilots and pilot beams	12	10	6	1	7	6
Plugs and studs	..	..	..	..	1	..
Quills	..	4	7	6	3	..
Rods, main, side, and drive shafts	4	2	2	2	23	2
Sanders	56	34	28	37	52	25

Springs and spring rigging, driving and truck	58	50	16	43	36	29
Steam pipes	1	4	..	5	1	2
Steps, footboards, etc....	35	22	18	23	13	..
Switches, hand-operated, and fuses	2	3	5	7	2	2
Transformers, resistors, and rheostats	3	1	1	3	..	..
Trucks	30	43	33	40	41	42
Water tanks	1	..	1	..	1	..
Water glasses, fittings, and shields	1	1	1	3	..	4
Warning signal appliances	4	..	1	3	2	1
Wheels	28	22	16	11	21	26
Miscellaneous	8	15	10	7	20	39
Total number of defects	905	766	696	769	991	674
Locomotive units reported	3,389	2,987	2,716	2,555	2,416	2,361
Locomotive units inspected	5,558	4,974	4,581	4,024	3,615	3,118
Locomotive units defective	319	298	260	274	328	252
Percentage inspected found defective	6	6	6	7	9	8
Locomotive units ordered out of service	21	16	14	9	24	11

of road; these failures, in addition to increasing the peril to life and limb of employees and others and increasing the ultimate cost of repairs, result in delay to the train involved and frequently affect the orderly movement of other trains. Avoidance of failures of locomotives on the line of road is an essential component of satisfactory railroad performance and it is therefore essential that the practice of applying temporary repairs of the character indicated be reduced to the absolute minimum.

Before a locomotive is started on any trip it should be known that all parts and appurtenances are in safe and suitable condition for service rather than to assume, as is sometimes done, that if the locomotive arrived under its own power it can go out again. All parts to which repairs have been made, the condition or capacity of which may not be determinable by visual inspection, such as air compressors, injectors, and feed-water pumps, should be appropriately tested for the output required under service conditions in addition to the usual examinations made when a locomotive is being prepared for service, since mere observation that these parts "work" when a locomotive is at the terminal is not sufficient to determine whether or not their capacity has been restored. In investigations of accidents we sometimes find reports on the defect that caused the accident repeated many times until failure eventually occurred, together with signatures on the reports indicating that the reported work had been done, or at least that repairs to the reported defects had been attempted each time a report was made. This is proof that safe repairs required on the locomotive had not been made and that labor had been wasted.

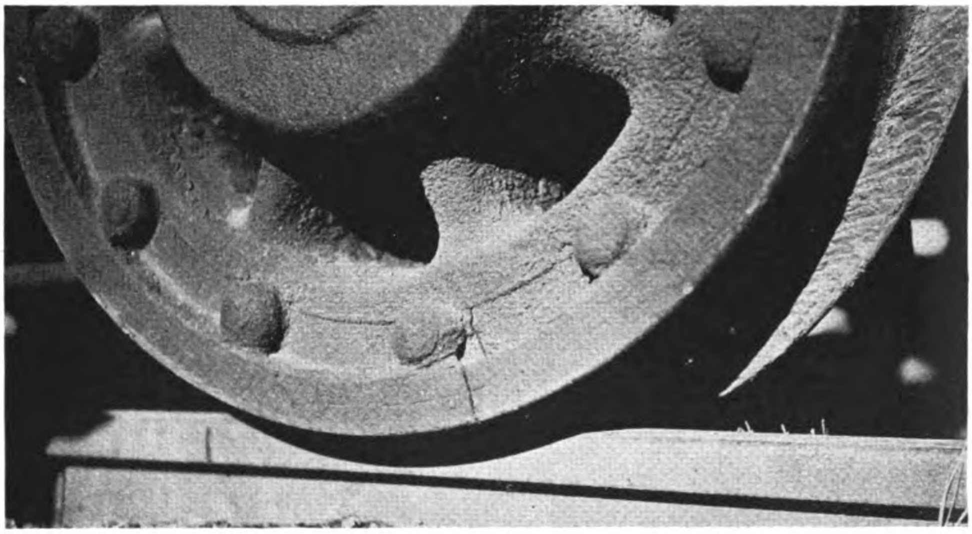


Fig. 8—A crack through the tire of an engine-truck wheel caused by application of fusion welding to build up the worn flange—Failure occurred after welding before the locomotive was placed in service —The crack extended through the entire section of the tire approximately 1 in. from the edge of the bolt hole in the retainer lip

Complexity of the various appurtenances installed on modern locomotives, coupled with the placing in service of a large number of older locomotives which have been out of service for periods ranging up to 10 years or more, many of which are practically obsolete and therefore not well adapted to the giving of satisfactory performance under present conditions, and the intensive use of all locomotives now in service necessitate increased vigilance on the part of all concerned to effectuate the purpose of the act and to comply with the proclamation of the President, dated August 18, 1941. This proclamation calls upon the National Safety Council to mobilize its nation-wide resources in leading a concerted and intensified campaign against accidents, and also calls upon every citizen, in public or private capacity, to enlist in this campaign and do his part in preventing wastage of human and material resources through accidents.

Continuous improvements have been made in design and construction of locomotives since the inception of the use of steam power on railroads and improvements will continue, in some measure, in new production during the emergency. All of the outstanding improvements in locomotive design and construction, as with practically all other mechanisms, have been brought about by the process of evolution rather than revolution. All have gone through periods of trial and adjustment, and many have been materially changed from the original conception before satisfactory performance could be obtained.

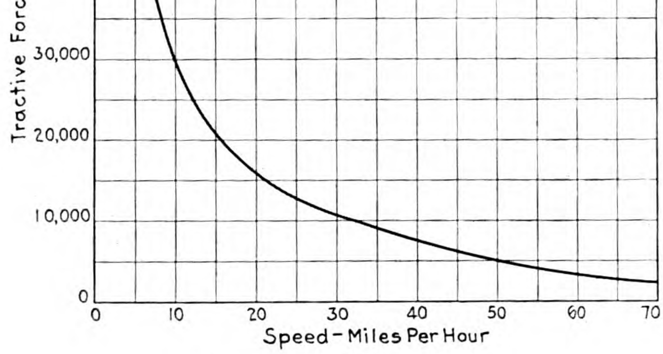
It therefore cannot be expected that major changes in design, construction methods, or practices will produce any appreciable beneficial effect in time to ease the current and prospective general situation. On the contrary, attempts to produce such changes, due to the accompanying necessary variation in established practices of the builders and the railroads, the necessity for close observation and supervision over the trial periods, and the changes in or the transfer of skill that may be required of the builders' employees and the railroads' maintenance forces, would delay production of locomotives, absorb manpower that could well be used for immediate and more important purposes, and result in delays to repairs because of interruptions in the established orderly work of the maintenance forces. Efforts to build and use locomotives involving designs and constructions that have not fully justified themselves through general use should, for the common good, be held in abeyance until the cessation of the emergency.

Alco-G.E. Road Switchers

New design of Diesel-electric locomotive has 69,000-lb. starting tractive force and is adapted for service at 70 m.p.h. maximum speeds

SEVERAL railroads have already taken delivery of Diesel-electric road switching locomotives of a design developed jointly by the American Locomotive Company and General Electric Company and built at the Schenectady plant of the former company. These locomotives are designed for road service at speeds up to 70 m.p.h. and, when used for passenger terminal switching or main-line service, can be equipped with train heating boilers. While the basic design of this type of locomotive is essentially the same as the yard switching locomotives which this builder has been delivering for some time, this new type has high-speed trucks; a short additional hood to accommodate the heating boiler; multiple-unit control and a higher gear ratio.

The general structure of the locomotive consists of a welded steel underframe carried on cast steel swivel trucks. The operator's cab is located near one end with a long forward hood enclosing the power plant, auxiliary generator, air compressor and contactors. The radiator compartment is at the front of this hood and the auxiliaries follow in the order named from front to rear. The rear hood of the same size except shorter, encloses the train heating boiler, when furnished.



Speed-tractive-force curve

The windows in the cab are exceptionally large, giving good visibility over the top of the hoods. Visibility is further improved by an elevated operator's seat. The cab is heated by an automotive type hot water heater.

The Diesel Engine

The Alco 1,000-hp. Diesel engine is a 12½-in. by 13-in. engine of the turbo-charged type (Buchi system). Generally speaking, it is similar to that found on other Alco Diesel-electric locomotives.

The water and oil-cooling radiators are of the sectional core type. The radiator fans are V-belt-driven from the engine and shutters, operated by a control in the cab, are applied outside of the radiators. To maintain a nearly constant load on the radiator fan, by-pass shutters are located inside the radiator compartment. They are so arranged that a corresponding graduated movement of the by-pass shutters occurs automatically with a movement of the outside shutters. When the outside shutters are closed, the by-pass shutters are open, and vice versa. This allows complete control of the degree of cooling desired.

Electrical Equipment

The electrical equipment is built entirely by the General Electric Company. It includes the main traction

generator, a belt-driven exciter auxiliary generator, four GE-731 series traction motors and complete Type P control equipment.

The main generator is supported by the engine frame and two spring-loaded feet attached to the generator frame. This construction insures alinement between the engine and the generator armature. A single self-alining roller bearing is used at the outboard end of the armature shaft. The auxiliary set consists of a split-pole exciter which furnishes excitation to the main generator and an auxiliary generator which supplies power for the control circuits, the electrically operated auxiliaries and for charging a 32-cell starting and lighting battery. The armatures of the two machines are on the same shaft. The main generator furnishes power for the four direct-current commutating-pole traction motors which are permanently connected two in series. These motors are supported in the locomotive truck by sleeve-type axle bearings and spring-nose suspension from the truck frame. The motor armature bearings are the roller type. The armature shaft is so installed that it can be removed without disturbing the windings or commutator. The motor frame is an integral steel casting and has large openings for inspecting brushes.

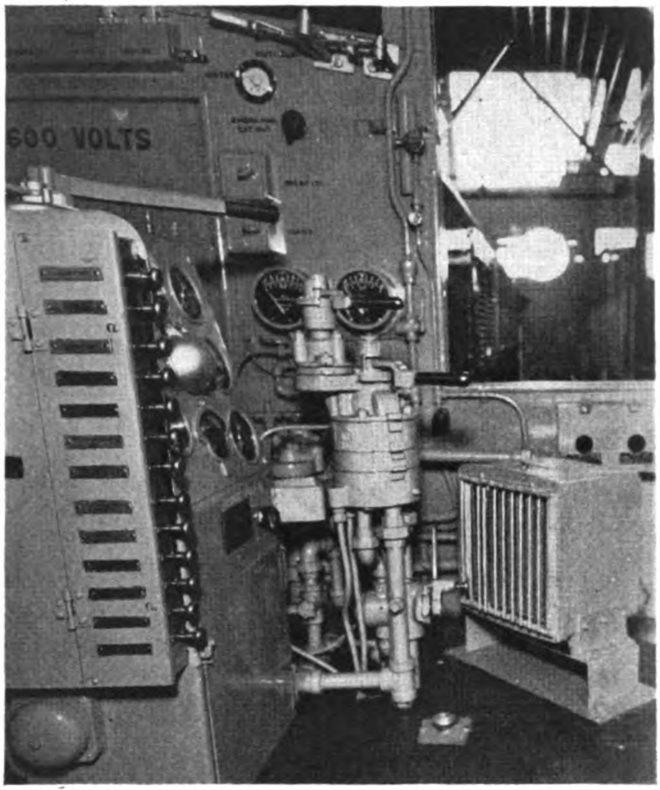
Comparative Characteristics of Alco-G.E. 1,000-Hp. Diesel-Electric Road and Yard Switcher

	Road Switcher	Yard Switcher
Driving motors, number	Four	Four
Maximum speed restriction, m.p.h.	70	60
Gear ratio, traction motors	73/18	75/16
Driving wheels, number (pairs)	Four	Four
diameter, in.	40	40
Weights:		
On drivers, lb.	230,000	230,000
Total locomotive, lb.	230,000	230,000
Wheelbase, each truck rigid, ft.-in.	9-4	8-0
Total locomotive, ft.-in.	40-4	30-6
Maximum overall locomotive dimensions:		
Height, ft.-in.	14-6	14-6
Width, ft.-in.	10-0	10-0
Length, inside knuckles, ft.-in.	54-11¾	45-5¾
Starting tractive force (at 30 per cent adhesion), lb.	69,000	69,000
Tractive force, continuous, lb.	29,500	34,000
Minimum radius curvature (locomotive alone), ft.	100	50
Lubricating oil, gal.	80	80
Engine cooling water, gal.	240	240
Sand, cu. ft.	27	27
Capacity, boiler water tank (with heating boiler), gal.	800	...
Capacity, fuel oil tank (with heating boiler), gal.	800	...
Capacity fuel oil (without heating boiler), gal.	1,600 (two tanks)	635 (one tank)

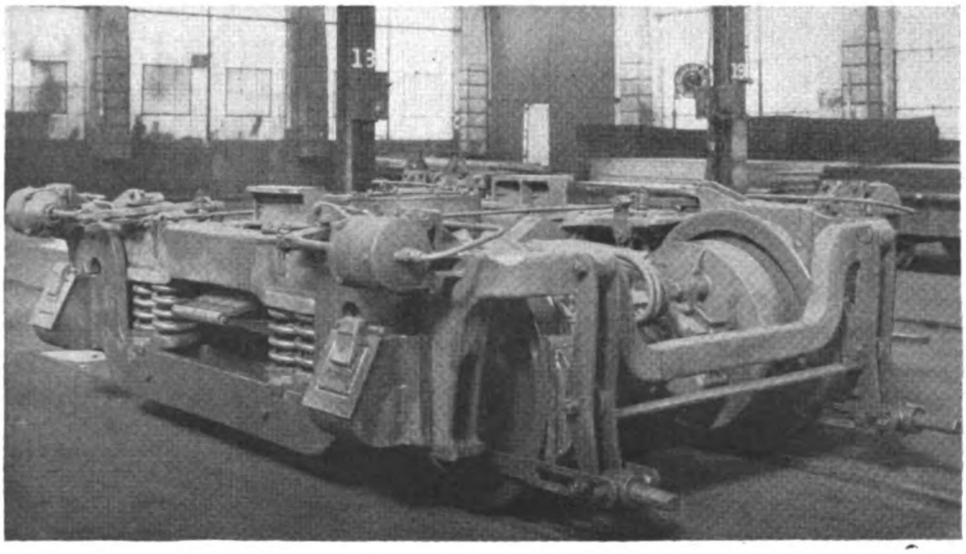
The Type P single-end, single-unit control functions with a minimum of attention on the part of the engine operator. The initial movement of the locomotive throttle closes contacts which operate the main circuit and field contactors. Additional movement of this throttle controls the engine governor, regulating the speed of the locomotive. The traction-motor reverser and line contactors are pneumatically operated and the remaining contactors magnetically operated.

The traction motors are arranged to operate in series and series parallel, and there are also connections for shunt-field operation. The motor connections are changed automatically from series to series-parallel and from series-parallel-full-field to shunt-field operation.

Automatic transfers are provided not only at rated engine speed but over the entire operating speed range of the engine. The relay which effects this automatic control materially increases the engine utilization during partial control and as a result more rapid acceleration as well as higher average and top locomotive speeds are



The controls at the operator's station—An automotive type hot-water heater is used in the cab



The trucks for these locomotives are designed with both helical and elliptic springs for good riding qualities at moderately high speeds

obtained when operated at reduced engine speeds. A current relay and indicating light give visible warning when the locomotive is operating below the proper speed range with the motors in the series-parallel connection. A wheel slipping relay with a buzzer also operates to warn the operator when any pair of wheels slips.

The master controller is used to select the motor combination and the direction of movement of the locomotive. This controller has three forward, one off and three reverse positions. When the controller handle is placed in the third operating position before opening the throttle, the motor connections will then be changed automatically from series to series-parallel and field shunting without attention on the part of the operator. If desired, the handle can be placed in the first forward or first reverse position so that it will maintain series connections of the motors. A multi-button switch at the operating stations gives the engineer control of the fuel pump, engine starting and the several lighting circuits.

The multiple-unit feature which may be used with this control equipment permits two of these units to be operated in multiple, making, for example, a freight locomotive of 2,000 hp.

The Heating Boiler

The largest size boiler that can be located under the short hood has a capacity of 2,250 lb. per hr. It is manufactured by the Vapor Car Heating Company. The size of boiler installed in the locomotive depends entirely upon the service the locomotive is to be used in. In some cases a 1,600 lb. per hr. boiler may be adequate.

One 800 gal. tank is located under the frame between the trucks to carry boiler water. If a boiler is not installed in the locomotive this tank is piped to the fuel oil tank of 800 gal. This means the locomotive will then have a total capacity of 1,600 gal. of fuel.

Trucks and Brake Equipment

The trucks used on the road switching locomotives are of the swing bolster drop equalizer type suitable for operation at moderately high speeds. These trucks are manufactured by the General Steel Castings Corporation. The truck wheelbase is 9 ft. 4 in. and the journal boxes are arranged for the lateral thrust to be taken on the ends of the axles. The axles have 7 in. by 14 in. plain journals with collars.

The truck wheels are 40 in. in diameter and provision is made for two GE-731 traction motors in each truck with the necessary connections for ventilating air ducts at the top of each motor direct from ducts in the cab underframe. The motor nose suspension is of the spring type. The spring rigging includes elliptic springs between the bolster and the truck frame and helical springs to carry the side frame on the equalizers. Two helical springs are used side by side at each end of each equalizer. The center plate and the journal box pedestal faces are equipped with wear plates. The truck brake equipment consists of clasp type brakes, permitting the use of flanged type brake shoes. Four 9-in. by 8-in. brake cylinders are outside mounted on each truck.

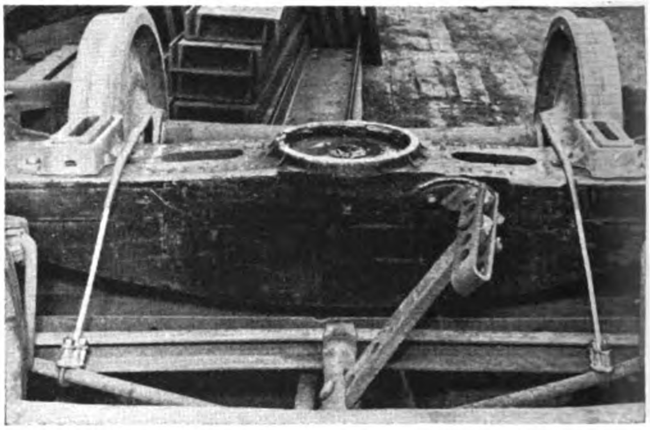
The air brake equipment for the locomotive is the Type 14-EL. The Westinghouse air compressor is driven directly from the main engine shaft and is a two-stage air cooled compressor with a capacity of 228 cu. ft. per min. at 740 r.p.m. and 83 cu. ft. per minute at engine idling speed.

Road switchers of this type have been delivered to the Atlanta & Saint Andrews Bay; the Chicago, Rock Island & Pacific; the Chicago, Milwaukee, St. Paul & Pacific, and the Tennessee Coal, Iron and Railroad Company.

Universal Brake Beam Safety Support

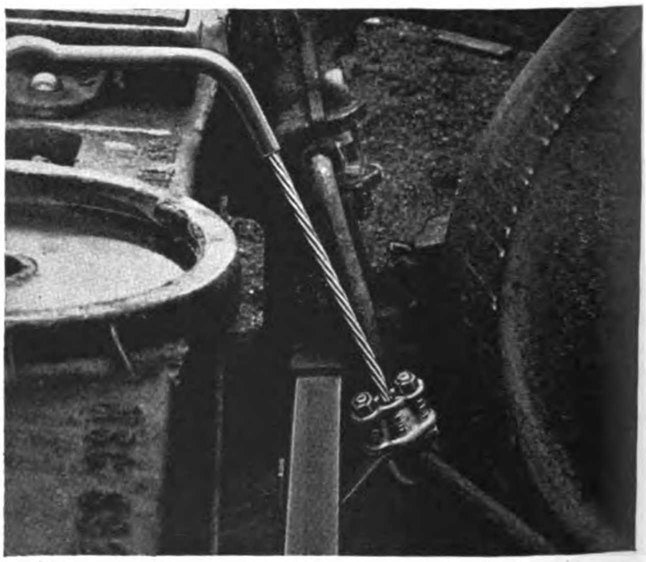
A brake-beam safety support, designed to be applicable to any type of freight-car truck and give positive assurance against dropping of the brake beams under any conditions of brake hanger or brake-head failure, has recently been developed by the Grip Nut Company, Chicago. This new support, known as the Universal brake-beam safety support, has been thoroughly tested at the Armour Institute of Technology laboratories, the cable failing at a load of 17,170 lb., which indicates a high factor of safety based on a maximum tangential load of approximately 1,500 lb. on the brake hanger. This particular type of safety support has been approved by the A. A. R., Mechanical division, as an acceptable equivalent for use on cars in interchange service.

The new brake-beam safety support consists simply of a short length of ½-in. double-galvanized cable (two



Universal brake-beam safety support applied to a conventional freight-car truck—The cables, attached to the tension rod, clear the bolster

per truck), connected by means of a special malleable-iron fitting on each end to the tension members of the two brake beams and extending up to and over the



A steel guard extends under the compression member

bolster with about 1 in. to 1½ in. clearance, where the cable shape is fixed by means of a formed section of ½-in. pipe which encloses it. This safety support does

(*Continued on page 66*)

Bureau of Safety Report

During the fiscal year ended June 30, 1941, the annual report of S. N. Mills, director of the Bureau of Safety, Interstate Commerce Commission, records the fact that a total of 1,082,598 freight cars were inspected; that 30,443 safety-appliance defects were found on 26,634 cars; that 23,660 passenger cars were inspected and 947 defects found on 664 cars, and that 13,432 locomotives were inspected and 1,247 defects found on 812 locomotives. The combined total of cars and locomotives inspected was 1,119,690 and the number of defects per 1,000 units inspected was 29.15 compared with 30.43 for the preceding fiscal year.

During the year, air-brake tests were made on 2,798 trains prepared for departure from terminals. These trains consisted of 121,476 cars, on which air brakes of 121,378 cars, or 99.92 per cent of the total, were operative. Air-brake tests were made on 942 trains upon arrival at terminals; these trains consisted of 46,427 cars, on which air brakes of 45,728 cars, or 98.49 per cent of the total, were operative.

In departing trains on which terminal tests of air brakes were made, all cars except 98 had operative brakes; however, in order to secure the percentages of operative brakes shown in the reports of these tests as submitted by our inspectors, 975 cars having defective or inoperative brakes were set out, and defective or inoperative brakes were repaired on 926 cars remaining in the trains. It should be borne in mind that these figures refer to trains which had been prepared for departure; yet, when afterward tested by our inspectors, it was found necessary to set out, or repair the brakes on, an average of 2 cars for every 3 trains.

After the passage of 65 per cent of the 10-year period for complete AB brake installations less than 26 per cent of the freight cars in interchange have been equipped—Current traffic conditions have introduced increased hazards and necessitate increased inspection and supervision to insure that safety is not sacrificed, says the report

In the 942 arriving trains tested, inoperative brakes were found on 699 cars, an average of 3 cars with inoperative brakes for every 4 trains tested.

In the last annual report attention was called to the discrepancy existing between safety-appliance equipment installed on streamline passenger-train cars, constructed in recent years, and specifications for safety appliances of passenger-train cars contained in the Commission's order of March 13, 1911; also mention was made of use by certain carriers of devices designed to make lock blocks of tight-lock couplers inoperative in order to compensate for defects in the coupler which were productive of undesired separation of trains. Use of improper running boards on steam locomotives, and also of incorrect end and side handholds on steam and Diesel-electric locomotives, were mentioned. Progress in securing correction of these defective installations was made during the year and, as to safety appliances of streamline passenger-train cars, correction is nearly completed.

During the year, 32 complaints were investigated; 18 of these complaints referred to power brakes and 14 complaints referred to other safety appliances. In 6 cases, evidence of violation of law was obtained and prosecutions were instituted. In most of the other cases corrections of the conditions complained of were effected as a result of the investigations.

Summary of Defective Appliances on Freight and Passenger Cars and Locomotives Reported by Inspectors During the Fiscal Year Ended June 30, 1941

	Inspected	Defective	Per cent defective	Defects reported
Freight cars	1,082,598	26,634	2.46	30,443
Passenger cars	23,660	664	2.81	947
Locomotives	13,432	812	6.05	1,247

Number of Defects per 1,000 Inspected

Coupler	.54
Knuckle	.17
Lock block	2.25
Uncoupling mechanism	1.77
Lift lock	.05
Kicker	.07
Wearing parts of air brake	10.86
Handhold	2.84
Handrail	.15
Ladder	1.33
Running board	2.82
Brake shaft	.85
Brake wheel	1.05
Ratchet wheel	.73
Brake pawl	.38
Brake step	.14
Brake-shaft stirrup	.07
Brake-shaft support	.11
Ratchet brake	.04
Gear brake	.04
Brake chain	.49
Hand-brake rod	.08
Top truck rod	.08
Bottom truck rod	.002
Cylinder rod	.004
Floating-lever fulcrum	.004
Cylinder lever	.006
Floating lever	.004
Truck levers	.03
Brake beam	.33
Brake shoe	.51
Brake hanger	.04
Cotter keys for foundation brake rigging	.09
Hand brake	.49
Sill step	.61
Platform sill step	.02
Side-door sill step	.02
Footboard sill step	.05
Pilot sill step	.005
Step for headlight	.007
Power brake	.007
All classes	29.15

Progress of AB Brake Installation Slow

The following is a record as of June 30, 1941, of the number and percentage of interchange freight cars equipped with power brakes conforming to specifications of the Association of American Railroads, effective September 1, 1933:

Car owners reporting	Number of owners reporting	Number of cars owned	Number of cars equipped with such brakes	Per cent
Railroads	168	1,744,574	483,240	27.70
Private car lines	198	276,838	37,901	13.69
Total	366	2,021,412	521,141	25.78

This record indicates an increase during the year of 142,745 cars equipped with brakes of this type; of this number 65,719 were new cars. A rule adopted by the Association of American Railroads, effective January 1, 1935, requires all freight cars in interchange service to be equipped on or before January 1, 1945, with air brakes conforming with these specifications. As shown by the foregoing record, during 6½ years, or 65 per cent of the 10-year period allotted for making this improvement, only 25.78 per cent of the freight cars in interchange service have been equipped with the present standard apparatus.

For the past 4 years each annual report of this Bureau has directed attention to unsatisfactory progress in this connection and has urged action to expedite this installation. Analysis of the situation as of December 31, 1940, disclosed that 1,031,658 cars, owned by 125 railroads, which were not then equipped with the improved type of air brakes were scheduled to be continued in service beyond January 1 1945, and that only 71,622 of these cars were scheduled to be equipped with the new air brakes during the year 1941. On this basis more than 14 years would be required to complete installation of this equipment; furthermore, 53 of these 125 railroads, owning 347,322 of these cars, reported no air-brake-conversion program for the year 1941. As shown by the percentages in the foregoing table, the private-car lines have made even less progress than the railroads.

Certain hopper cars are constructed with arched ends of such design that top treads of end ladders cannot be located in conformity with the Commission's order specifying safety-appliance standards. These cars do not conform with the Commission's requirements or with the standard practice of the A. A. R.

During the year the Bureau continued its cooperation with the Association of American Railroads in a series of tests to determine the proper cleaning period for "AB" brakes. The results reported during the year disclosed material improvement, largely due to the use of improved air strainers.

In the fiscal year 1936 the Bureau cooperated with the Association of American Railroads in formulating standard specifications covering geared hand brakes for freight cars, and at present a series of tests is in progress to determine whether devices placed in service under those specifications comply with the requirements.

On June 30, 1941, 43 railroads and 6 private car lines had reported a total of 25,770 freight cars which had been equipped with metallic running boards of various types, as authorized by the Commission's order of December 17, 1932, and preceding orders of similar nature. During the year our inspectors reported the results of numerous inspections of these installations.

Hours of Service

During the year ended June 30, 1941, hours-of-service reports were filed by 755 railroads; of these, 174 reported a total of 7,409 instances of all classes of excess service, an increase of 3,140 instances as compared with the previous year; the remaining 581 roads filed reports showing that no service in excess of that authorized by the law was performed by their employees.

The 7,409 instances of excess service reported comprise 1,456 employees who remained on duty longer than 16 consecutive hours; 238 employees who continued on duty after having been on duty 16 hours in the aggregate in a 24-hour period; 24 employees who, having been on duty 16 consecutive hours, were returned to duty with less than 10 consecutive hours off duty; 1 employee, who, having been on duty longer than 16 hours in the aggregate in a 24-hour period, was returned to duty with less than 8 consecutive hours off duty; 5,480 employees at continuously operated offices who remained on duty longer than 9 hours and 210 employees at offices operated only during the daytime who remained on duty longer than 13 hours.

Accident Prevention

By a proclamation issued August 18, 1941, the President directed attention to the wastage of human and material resources of the Nation through accidents, and called upon all citizens in public or private capacity to engage in a campaign for the prevention of accidents.

The provisions of law and the orders of the Commission upon which the work of the Bureau of Safety is based establish fundamental and minimum requirements which are essential to safe and efficient railroad operation. Effective administration of these provisions has been an important factor in the reduction in accidents and casualties which has been achieved during the past 20 years. Continued effective administration of these provisions is imperative. Current traffic conditions have introduced increased hazards. Cars which have been stored are being placed in service, cars in service are being utilized to a greater extent, increased numbers of trains are being operated, there has been a material increase in the number of railroad employees who are engaged in or connected with the movement of trains, and extensive revisions of signal systems are in progress to expedite and safeguard increasing traffic. These conditions necessitate increased inspection and supervision to insure that safety is not sacrificed to the rush and hurry of the day, that defective equipment is not used in an effort to promote the convenience of the moment, and that there is no relaxation of the precautions and standards which are necessary for the safety of railroad operation and the protection of railroad employees who form the vital elements of an efficient transportation system. As the President very aptly stated, these unusual times require unusual safety efforts. The forces and facilities of the Bureau of Safety are being utilized to full capacity, as set forth in detail in the foregoing portions of this report. The maintenance of adequate safety standards in railroad operation is essential to uninterrupted flow of traffic and proper development and functioning of national-defense activities.

Universal Brake-Beam Safety Support

(Continued from page 64)

not touch the bolster at any point, but will come into action immediately on the failure of any part of the brake beam or brake-beam hanger. Provisions for supporting the brake-beam compression member in case it becomes disengaged from the brake head is afforded by ½-in. by 2-in. steel guards which extend around the compression members and are held rigidly between the malleable fittings and the tension members by U-bolt and Grip Nut connections, as shown in one of the close-up views. The cable is anchored in the malleable fittings by expanding the wires and filling the taper cavities with molten zinc.

Only one design is required on either the conventional or spring-plankless freight-car truck. Additional advantages include the complete elimination of moving parts and consequent wear; all parts are subject to tension only, while functioning; number of working parts minimized; elimination of spring-plank drilling and unbalanced loading; possibility of replacing brake beams by the removal and replacement of four ½-in. nuts.

EDITORIALS

Our Contest

Seventy-five papers were received in the *Railway Mechanical Engineer* competition for the two best papers on ways and means of improving the mechanical department's operations or practices to increase production and secure a larger use from the equipment and facilities. The subjects discussed by the contestants cover such a wide range of mechanical department activities that the task of judging the papers and selecting the winners promises to be no easy one. We have examined the contributions sufficiently, however, to come to one very definite conclusion. The material contained in them is of such value that we propose to devote the greater part, or all of our April issue, to its presentation. The prize winning papers will, of course, be presented in full, with the usual editing, but several of the other papers also will probably be used in whole or in large part. In addition to this, high spot material will be selected from a large number of the contributions. That will be the program for our April issue, as we see it now.

Save it or Scrap It?

Usable second-hand material is frequently a life saver in these times to shop foremen, maintenance men and others on a railroad property who have a job to do and find that new materials are not on hand and will not be available for weeks or months. However, the practice of saving everything that might possibly be useful at some future date can be carried to extremes. Steel mills are crying for scrap with which to maintain open-hearth production and, in consideration of their need, no other industry is justified in the maintenance of large stock piles of second-hand materials unless there is a probable definite need for the material saved. General orders issued to save all usable second-hand material on the chance that it may some day come in handy can adversely affect the supply of new materials immediately required. Good judgment may dictate that certain parts, sheet steel or shapes be retained when cars and locomotives are stripped for repair or dismantled, but this judgment is one to be exercised by someone who is in a position to know the real value and need for such saving in the light of production requirements and the availability of new materials of the same type.

Second-hand materials will help to repair cars and locomotives but will not build new ones; scrap with the additions of ore in the open hearths will furnish the steel required in the programs now under way to increase the motive power and rolling stock of the railroads in the present emergency. It may well be that on the properties of the railroads today, in so-called second-hand stock piles, is a part of the answer to the problem of obtaining new steel.

Conserving Rubber Hose

Earnest consideration is now being given to the subject of conserving rubber in all of its forms and combinations as now used in railway equipment and at railway shops and engine terminals throughout the country. A considerable amount of rubber in the aggregate is utilized in the construction of passenger-car trucks and draft gears, to promote smooth, quiet operation; for seat cushions, mattresses, carpet pads, etc., in passenger cars; and also for certain types of spring snubbers in freight cars. Unquestionably the greatest single use of rubber by the railways however, is for the multitudinous different kinds and sizes of rubber hose required for air-brake, steam, water and signal-line connections between cars and locomotives; for squirt hose on locomotives, and for the extensive air, steam and water lines used in railway shops and engine terminals for such purposes as operating air tools, washing boilers and cars, gas welding, sandblasting, etc.

Experiments are now under way looking toward the use of substitute materials wherever possible and it is obvious that every effort should be made to minimize the use of rubber hose and extend the life of that which must be employed. In view of the indispensable part which transportation plays in national defense and the fact that, without maintenance, equipment cannot be kept in service, it seems certain that enough rubber hose to meet railroad minimum requirements must and will be made available, but it is a patriotic duty of railway men to conserve this important defense material in every way possible.

Definite steps are being taken at the present time, for example, to see what can be done to reclaim porous air-brake hose by vulcanizing the interior when the fabric is uninjured and, except for a slight porosity, the hose

is in condition to give satisfactory service for an extended period of time. In railway shops and engine terminals much can be done to reduce the amount of rubber hose required by extending pipe lines so that shorter lengths of hose will reach the work. Rubber hose, issued from the tool room, may be supplied in reduced lengths which are long enough for ordinary air-tool operations, but which may be coupled together when, on occasion, it is necessary to reach work at a more distant point. At practically every railway shop and engine terminal in the country careful checking will doubtless show some opportunity to extend the life of rubber hose by greater care in handling; protecting hose at all walkways where trucks must pass; and swinging hose from overhead supports, wherever possible, to avoid dragging it on the ground or shop floor. The importance of this work, in the interest of economy as well as national defense, is such as probably to justify appointing some supervisor, lead man or special committee at each shop point with the primary job of conserving rubber hose and having authority to enforce such shop regulations and recommended practices as may be adopted having this end in view.

Orders for Diesel Power Set New Record in 1941

Each year for the past three or four years, in commenting on the extent to which Diesel-powered locomotives have been ordered by the railroads, it has been possible to say that the number of units ordered has served to create new records with respect to such installations. At the end of 1939, the end of a 15-year period since the first 300-hp. Diesel-electric switcher was placed in service, there was a total of 674 Diesel switching and road locomotives in service on the railroads of the United States. In the field of switching locomotives alone, the total engine horsepower at the end of 1939 was 397,380, while at the same time there was only 72,000 hp. of road-passenger locomotives in service, there having been no road freight locomotives introduced up to that time.

In the year 1940 the roads went into the buying of Diesel-electric power in earnest, having introduced 340 switching locomotives with a total engine horsepower of 240,640; 62 road-passenger locomotives with a total engine horsepower of 168,000; and, for the first time, eight road freight locomotives having a total of 21,600 hp. The year 1940, therefore, set a new record for Diesel installations with over 400 units installed, having a total horsepower of over 430,000. Cumulative totals at the end of the year 1940 were 1,084 Diesel-powered locomotives in service having a total engine horsepower of 1,006,320.

The orders placed for this type of motive power during the year 1941 not only set some more new records with respect to the number of units but also established some significant trends. The orders during last year for 598 switching locomotives with a total of 468,000 hp. brought the total number of switchers in service for the 17-year period up to 1,539, having an aggregate engine horsepower of 1,106,138. At the same time there were 122 Diesel road locomotives ordered, 62 passenger locomotives of a total of 166,800 hp., and 60 road-freight locomotives having a total of 238,110 hp. The orders during 1941 brought the total number of Diesel-powered locomotives of all types in railroad service to 1,804 with an aggregate engine horsepower of 1,879,348. During the last four or five years, cumulative total engine horsepower of all Diesel-powered locomotives has almost been double that of the previous year.

Before commenting on some of the interesting trends in connection with the installation of this type of power, it is worth while to observe what the influence of the installation of Diesel-powered switching locomotives has been on the use of steam switchers. In the five-year period ending in 1929, 729 steam switchers were ordered, and at the end of 1929 the Class I roads owned 10,416 steam switchers having an aggregate tractive force of over 383 million lb. Five years later, by the end of 1934, the ownership of steam switchers had dropped to 8,712, having an aggregate tractive force of 342 million lb. During that five-year period, only 118 new steam switchers were ordered from builders. In the next five-year period, ending with 1939, 93 new steam switching units were ordered but the ownership had dropped to 7,509 with an aggregate tractive force of 306 million lb. In the two following years, 1940 and 1941, only six steam switchers were ordered and the ownership of that type of motive power at the end of 1941 was 7,115, having an aggregate tractive force of 295 million lb. The affect of the installation of Diesel switchers may be seen in the fact that while 1,539 Diesel-powered units were being installed, the inventory of steam switchers decreased by 3,587 units. The decrease in aggregate tractive force from 1925 to 1941 was 66 million lb.

Considering Diesel switching locomotives alone, the average locomotive horsepower increased from 450 in 1929 to 730 in 1939. The next year, 1940, witnessed the installation of 340 new units with a decided decrease in average locomotive horsepower. That year was a year of transition in which the large 1,000-hp. units had not yet been ordered in any great number and relatively large numbers of switching locomotives of less than 600 hp. were ordered, thus bringing down the average locomotive horsepower. In spite of the fact that in 1941 the number of small switching locomotives of less than 600 hp. increased considerably, there was also a tremendous increase in orders for the 1,000-hp. units. The railroads ordered 89 of these small switchers out of a total of 598, but while the number of units represented roughly 15 per cent of all the switchers ordered in 1941 the total engine horsepower—32,600—of these 89 small units represented but 7 per cent of the total horsepower of all switching

units. The average locomotive horsepower for the year 1941 was 780. This figure compares with 603 for the previous year, 730 for 1939 and 450 for the year 1929.

While there were eight road freight locomotives ordered in 1940, last year may be recorded as the year in which the road freight locomotive was really introduced on American railroads. The ordering of 60 units, having a total of 238,000 hp. is worth recording because it surpassed the total horsepower of the 62 units ordered for road passenger service by 71,000.

The record at the end of 17 years during which the Diesel has been in the service on American railroads stands at a total of 1,539 switching locomotives and 265 road locomotives. The average horsepower of all switching locomotives in service is 719 and of all road locomotives 2,920. A significant fact is that the inventory of steam switchers decreased but 400 units in the last two years as compared with 1,700 units in the five-year period from 1930 to 1934 inclusive, during which Diesel switcher installations began to assume proportions.

Safety—A Conservation Measure

In the annual reports of the directors of the Bureau of Locomotive Inspection and the Bureau of Safety, both of which are reviewed in this issue, stress is placed upon the proclamation of the President dated August 18, 1941, in which he directed attention to the wastage of human and material resources through accidents, and called upon the National Safety Council to mobilize its nation-wide resources in leading an intensified campaign against accidents. Both reports point out the special hazards, inherent in current traffic conditions on the railroads, which require increased attention to inspection and greater vigilance on the part of everyone concerned with keeping cars and locomotives in condition to render safe and reliable service, if accidents are not to increase. Fortunately, all types of equipment are in good condition, but it will require great energy and determination if the pressure and the temptation to relax current high standards of maintenance are to be resisted as the demand for equipment becomes more acute.

In the Bureau of Locomotive Inspection report particular attention is directed to the waste of material as well as the risk involved in making temporary repairs in the hope that a better opportunity will present itself later to do the thorough job which is really needed.

The experience of the city of London, England, in dealing with bombing damage is pertinent in this connection. After thorough consideration, it is said that the policy was adopted of making immediate permanent repairs to all underground services and all street surfaces damaged or destroyed by bombing, because of the great additional cost which would be involved in doing the whole job over again if temporary repairs were made immediately following the damage. Certainly the pressure to mend damage with the least immediate expenditure of labor and materials in that instance was as great as anything American railroads will be subjected to during the coming months of stress.

That some railroads have not been free from the practice of "going through the motions" without effective results has been clearly evident in locomotive accident reports for a long time. "We sometimes find reports on the defects that caused the accident repeated many times," says the 1941 report of the Director of the Bureau of Locomotive Inspection, "until failure eventually occurred, together with signatures on the reports indicating that the reported work had been done, or attempted, each time a report was made. This is proof that the safe repairs required to secure dependable operation of the locomotive had not been made and that labor and time had been wasted."

This condition has long applied to accidents caused by one class of crown-sheet failures. Investigations after boiler explosions have frequently revealed that defective operation of boiler feedwater devices have been repeatedly reported, repeatedly tinkered, but not restored to effective condition, ultimately becoming involved in one of the most violent types of accidents which can happen on a railroad. Although the number of accidents caused by these failures is small as compared to the total number of accidents caused by the failure of steam locomotives and their appurtenances, they continue year after year to account for a very large proportion of the deaths and their potential capacity for the destruction of property is tremendous.

These accidents are classified in two groups, those for which no contributory causes were found and those for which contributory causes or defects were found. It is true that there were only four accidents of the latter type, but they caused five deaths, and from them there is a disturbing lack of immunity.

Those of both groups, which together were the cause of 15 deaths during the last fiscal year, pose particularly difficult problems of supervision, because they both arise from the tendency toward callousness which insidiously creeps into men's attitudes toward risks with which they are constantly associated. This is reflected in the foremen's lack of sensitiveness to the implications of reports of frequently recurring defects in the same device on the same locomotive, and on the functioning of which men's lives depend. It is reflected, in the perfunctory attitude of the men whose lives are at stake toward maintaining and checking the level of the water in the boiler.

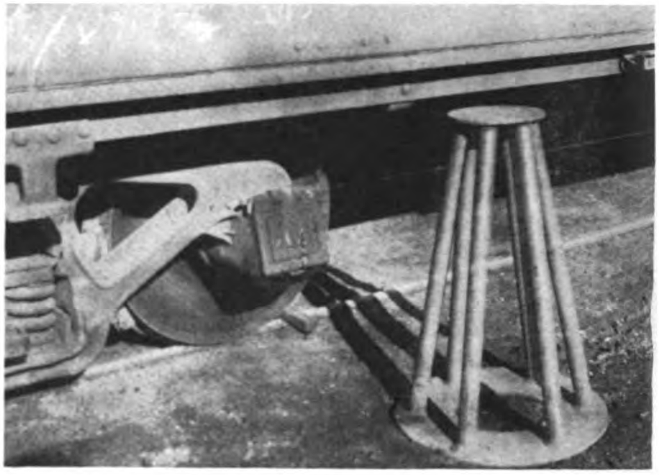
Surely the hazards involved are great enough to justify frequent checks on the attitude and procedure of foremen with respect to the maintenance of locomotive boiler feedwater apparatus, and special attention to developing precise habits of checking the water level when the locomotive is in service.

Rose Lake Car Shop Devices

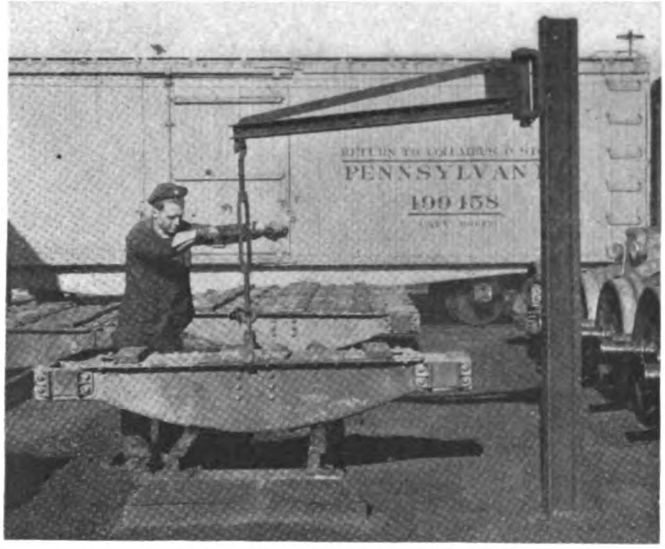
Several devices, shown in the illustrations, are used effectively to expedite the work of repairing freight cars at the Rose Lake shops of the Pennsylvania, East St. Louis, Ill. The first view shows a neat and very efficient jib crane, also the greased-rail arrangement used in storing and handling car bolsters, which weigh about 600 lb. apiece and are difficult to move around without the proper mechanical handling facilities.

The feature of special interest about the jib crane is the way in which the vertical post is mounted. This post consists of a 12-ft. section of 130-lb. steel rail, 5 ft. of which is set in the ground in a heavy reinforced concrete base so as to keep the rail both perpendicular and steady under the heaviest load which may be applied at the end of the boom. As a matter of fact, in setting this vertical rail, a hole was dug 5 ft. in diameter by 5 ft. deep and the rail set in a sheet-metal drum located at the center of the hole. The drum was loosely filled with scrap iron bars and then concrete was poured in and carefully tamped to fill all cavities. Enough additional concrete was then poured into the hole to cover the barrel and form a partial cone 5 ft. in diameter at the bottom, 5 ft. high and 18 in. in diameter at the top. Since the Pennsylvania freight yards and shop grounds at Rose Lake are all filled-in marsh land, east of the Mississippi, it was necessary to take more than usual precautions in setting this steel rail in the ground to make sure that it would remain frigid and vertical.

The boom of the jib crane is made of two brake-beam channels placed back to back with ½-in. spacers between and riveted, in conjunction with a ½-in. by 2-in. scrap-iron truss rod, to a bearing hinge, as illustrated. A coupler knuckle pin connects this hinge to a bearing bracket made of 1¼-in. by 5-in. steel, bent at right angles at the top and bottom, drilled with holes to accommodate the knuckle pin and securely fastened to the rail by means of six rivets through the rail base. A square-thread turn-buckle screw is used for lifting purposes, with a special hook for attachment to the bolster. The rails for bolster storage are set on wooden blocks about 14 in. high, spaced 26 in. apart, and are greased.

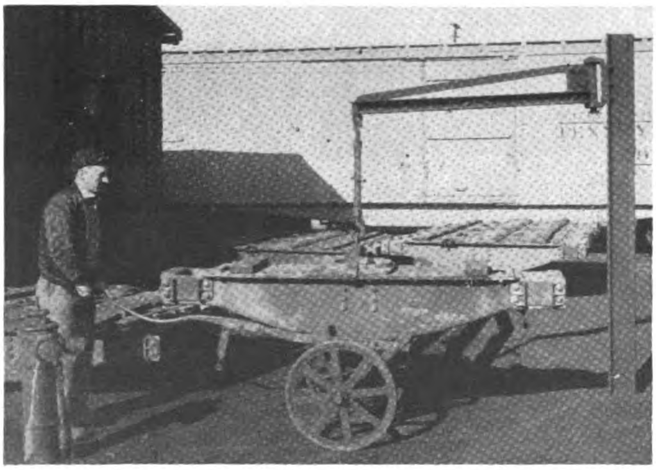


Lightweight but strong and easily portable tubular-steel car trestle



Jib crane and bolster storage rails at Rose Lake car shop

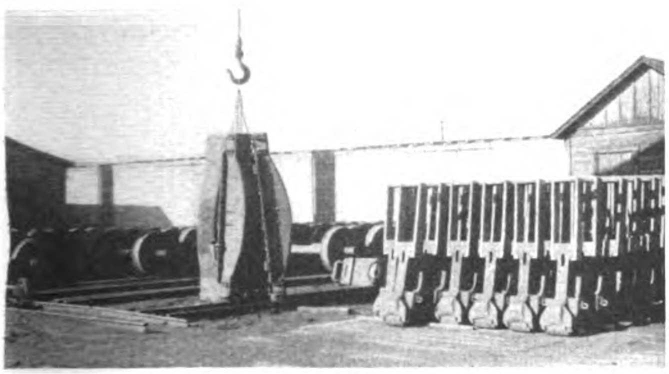
Lightweight welded tubular-steel hand ladder used for stencilling and other purposes



Two-wheel truck used in handling bolsters and couplers

Referring to the second view, it will be noted that the bolsters are easily handled from the storage position by means of the jib crane onto a two-wheel truck which is also used in moving couplers to the cars where they are to be installed.

An unusually light but strong and rigid car tresle is shown in the third illustration. It consists of a base plate 24 in. in diameter made of $\frac{3}{8}$-in. or $\frac{1}{2}$-in. boiler steel and having a 10-in. circular section cut out of the center and used for the top of the tresle. This trestle is 36 in. high, but this dimension may be varied to suit the individual requirements at different shops. The top plate and base plate of this trestle are separated by six pieces of scrap 2-in. boiler tubes, which, however, have been carefully selected to make sure that they have ample strength. These tubes are cut at the proper angle, top and bottom, to fit the two plates accurately and they are electrically welded to form a single rigid structure which



Method of handling four bolsters with a multiple-chain connection from the locomotive crane hook—Reclaimed couplers at the right

Large-capacity scrap buckets are made of discarded oil drums and handled by the locomotive crane

is unusually light in weight and can be readily rolled along the ground from one position to another. Frictional resistance on the top surface of this car trestle is increased by the application of a number of raised electric-welded spots.

The ladder shown in the fourth illustration also is of tubular-steel construction, being made of $\frac{3}{8}$-in. pipe with wooden treads 6 in. wide by 26 in. long and spaced 14 in. apart. The top tread is 12 in. wide, being supported on an enlargement of the ladder sides as shown in the illustration. The lower ends of the two pipe sections on each side are drawn together to a point and welded to give two non-slip points of contact with the ground. The step treads, except the one at the top, are supported on 1-in. angle-iron pieces welded between the side pipe sections. This ladder is 8 ft. long and used for stencilling cars, also for repairing side slats and doors on stock cars, as well as for similar operations on other classes of cars.

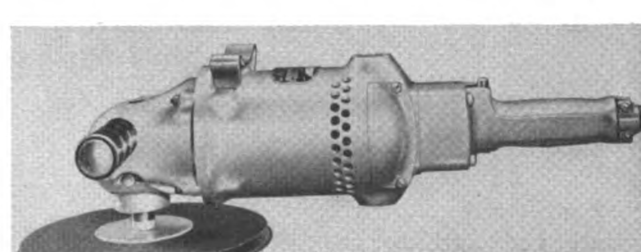
The fifth illustration shows how car bolsters are handled, both from the incoming car and also to the scrap car, by means of a four-chain extension from the locomotive crane hook, with a considerable saving of both time and labor. Reclaimed bolsters, also shown in this illustration, can be handled in the same way when necessary.

The sixth view shows one of a group of seven oil drums which have been converted into scrap buckets and are located at a central point at the Rose Lake car shop and used for the receipt and storage of scrap iron and steel car parts until such time as the drums are filled and can be emptied in the scrap car. One particular advantage of this method of handling scrap is that it can be segregated to a considerable extent before being placed in the scrap car and thus facilitate the work of unloading the car when received at the scrap dock.

The scrap bucket, illustrated, is made of an old oil drum 46 in. high by 52 in. in diameter, made of $\frac{3}{16}$-in. steel. A $\frac{1}{2}$-in. by 9-in. by 12-in. reinforcing plate is riveted on each side of the drum near the top and drilled with a 2-in. hole for use with crane hooks in handling the bucket to and from the scrap car. A staple is riveted to the bottom of this bucket on the outside near the center for the attachment of a light chain used in tipping the bucket during the unloading operation. The scrap bucket is filled with a special spreader bar with two side chains and hooks by the main hoist and a chain attachment from the bottom of the bucket to the auxiliary hoist is used in dumping.

Sander for Increased Output

Added recently to the line of tools manufactured by the Black & Decker Mfg. Co., Towson, Md., a 9-in. heavy-duty sander is designed to meet present day requirements for more output per tool. It is equipped with a universal motor and is furnished for use on lines carrying 110, 220 or 250 volts. The spindle speed, without load is 5,000 r.p.m. Intended primarily for sanding operations, the tool is so designed that wire cup brushes, saucer grinding wheels for right-angle grinding, planer



Heavy-duty sander intended to provide greater output per tool unit

heads for wood shaping and surfacing, and other accessories can be used. A new spindle lock, having a spring release operated by thumb pressure, which gives a positive locking to the grinding discs being used is an improved feature.

Pullman Car Maintenance And Periodic Inspection

*By W. T. Kidwell**

In addition to the daily handling of Pullman cars in and out of the yard, the testing of and repairs to air brakes, trucks, and running gear, with which the car man is primarily concerned, there are such features as car cleaning, maintenance of the lighting and air conditioning systems, the thousand and one items of hardware that have to be maintained; painting; upholstering; exchange of linen; stocking car with supplies, etc., which The Pullman Company has to worry about. Briefly, here are some of the details of this work.

A person leaving a hotel room in the morning would not expect to find it in the same condition when he returned in the evening, but would expect it to be in a clean and tidy condition. This applies to a Pullman car. Much has to be done between arrival and departure, and quite often this has to be done within an hour or two. Cleanliness—that which first meets the eye—is always of prime importance. The car has to be aired out; rubbish collected and removed; plush, carpet and bedding vacuumized; windows cleaned, and interior finish wiped down. The rubber tiling is scrubbed; wash basins, hoppers, metal work and hardware are cleaned and polished. Linen is exchanged and car supplies checked.

At certain periods, the car is given special strip cleaning when bedding, seats, seat backs, etc., are set aside, and the car thoroughly blown out with compressed air. Also, as parts of the inside finish show signs of dullness, the woodwork, headlinings and bunklinings are thoroughly washed and chamoised, and certain parts polished with wax. The carpet is removed and blown with compressed air. Blankets, mattresses and pillow covers are exchanged and those removed sent out for special cleaning. Upholstering is carefully inspected and repaired. Painters are constantly at work refinishing damaged or faded parts of the inside finish.

Attention to the Lighting Equipment and Batteries

When the car leaves a terminal, the lighting equipment is on its own. If something went wrong there would be no one, in most cases, available to make repairs until the car reached the end of its run. To furnish ample power and steady lights the equipment must be fully automatic. It must receive inspection and periodical attention during the yard layover to assure its good operating condition. The power is provided by a belt-driven generator and battery located under the car, controlled by regulators usually placed inside the car. It operates the same as an automobile system, the generator furnishing power for the lights, fans, electric razors and other electric appliances, and for charging the battery while the car is running. When the car is standing the battery furnishes power for these devices.

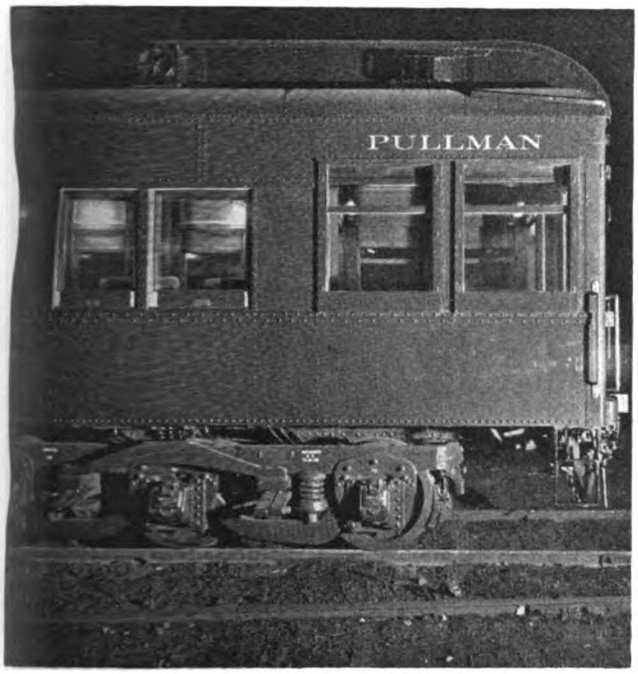
The battery must be inspected for loose connections and proper ventilation, and the box cleaned out. Water has to be added occasionally, the same as with an automobile battery. Generator brushes wear out, get stuck with dirt; bearings develop defects and have to be replaced. The belt has to be inspected for wear and other conditions, and has to be replaced from time to time. Generator suspensions, pulleys, and belt tension apparatus

* Yard foreman, Pullman Company, St. Louis, Mo. Mr. Kidwell's paper, abstracted above, was awarded a prize of $15 as the second best of seven short papers presented by car men from the ranks before the Car Department Association of St. Louis during 1941.

Pullman service track at a large passenger terminal

must be inspected for defects. Regulators use carbon discs and are affected by dust, overheating and adjustments, and require checking at regular intervals. These are all items the car-lighting man must check, in addition to seeing that the wiring is not grounded. He also repairs switches, changes burnt-out bulbs, and looks after various other details inside of the car.

If the generator or battery fails, power for the lighting system can be obtained temporarily from an adjoining car by connecting the two with a trainline connector provided for this purpose, but there is no temporary means of getting cooled air when the air-conditioning apparatus fails. Inspection of this apparatus is, therefore, doubly important. The air-conditioning system consists essentially of an air-circulating system, including apparatus for keeping the air in motion, cooling, heating, filtering and dehumidifying. The cooling apparatus, being the principal part, may be one of several mechanical types, a steam ejector, or an ice system, all in common use on Pullman cars.



A Pullman received at the coach yard at night for cleaning and servicing

Skilled Maintenance Required for Air-Cooling Apparatus

This apparatus is also fully automatic and only the closest attention at terminals by skilled maintenance men can provide the necessary assurance that it will operate properly throughout the trip. There are many operating parts that wear and get out of adjustment. Various kinds of lubricants are used periodically. Air filters, strainers, condensers, motors, speed controls and various control boxes have to be cleaned. Operating pressures and the adjustment of pressure switches and thermostatic valves require close and careful checking while the car is laying over in the yard. These, together with many details of lesser importance, keep the air-conditioning maintenance man always on the alert if he is to be a successful trouble-shooter.

It is the cooling equipment in the summer and the heating equipment in winter that he has to worry about. Along with air conditioning came the automatic control of temperature within the car when heat is required. This has progressed along with other features developed by the car builders. The passenger riding in the later type cars today can set the temperature in his room to suit his individual idea, and this temperature is maintained automatically. There are 45 automatic steam valves and 21 heating thermostats on the latest type of roomette car. In addition, there is an equal number of relays, control switches, and the necessary wiring to complete this system of control. There is much of this apparatus to be checked and repaired while the car lays over in the yard.

Small Items Demand Expert Attention

The hardware in a car is something else that meets the eye, and a passenger is quick to complain if something doesn't work right. Such items as door locks, handles, hinges, holders and checks, subject to severe service, require considerable attention. Water faucets must always provide a liberal flow of water, and not leak; basin drains must be kept clean so water will drain out quickly. There is the water-raising system with its automatic air-pressure-control valves, filling valves, strainers, etc., that have to be looked after.

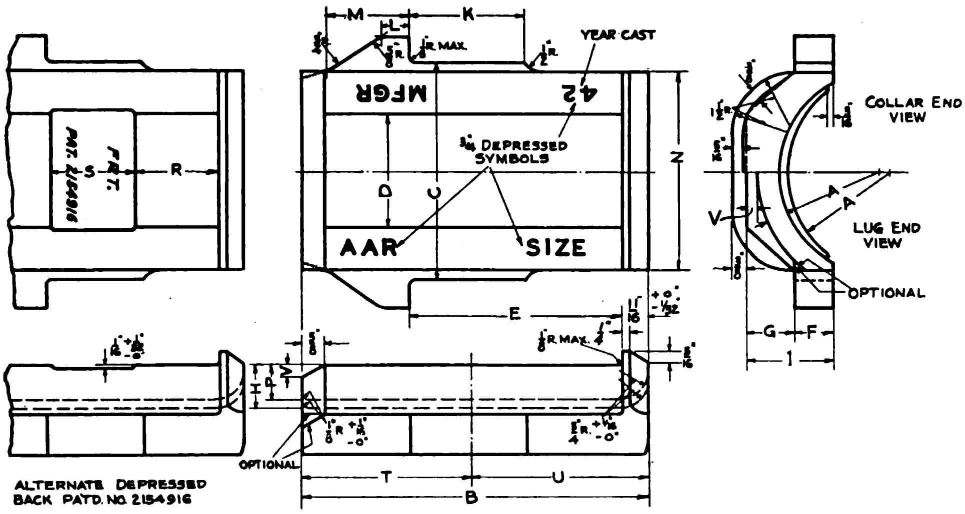
Hopper valves, especially on newer cars where the hopper folds back into a small cabinet, are highly complicated pieces of mechanism and subject to such defects as those caused by small grains of sand lodging on the valve seat, getting out of adjustment, worn gaskets, etc. Window glasses and mirrors get broken; window shades stick, screws become loose and may catch and tear a passenger's clothing. These, together with hundreds of smaller items of hardware on a car, require the constant attention of skilled mechanics.

The casual observer hasn't the slightest conception of what is required in the way of yard maintenance to present a car in neat and orderly appearance, with all the facilities functioning properly for his use and comfort. Were he to step into a railroad yard and watch the maintenance crew board the car and look after their work, to say he would be amazed is only putting it mildly; but it is a vital part of the Pullman service, and it is only a part of the whole job because, as all know only too well, railroad forces take care of an equally voluminous and complicated part of the work. All of us, if we are to work together smoothly and efficiently, must know something of the other fellow's job. What we are providing for the railroad passenger is something he accepts as a single unit when he buys his ticket, and to produce this successfully we must work as a single unit.

Journal Bearing Changed To Curtail Metal Content

Supplementing the circular letter issued recently by the Association of American Railroads, Mechanical Division, on the curtailment of the use of copper by the railroads, V. R. Hawthorne, executive vice-chairman, wrote to all members of the association on January 19, calling their attention to a modified design of journal bearing to be used during the present war emergency in order to conserve copper, tin and other critical materials. A drawing of the modified design was included with the letter. A number of changes in dimensions and some changes in form are shown.

In this letter, the manufacturers of journal bearings, including those railroads which make their own bearings, are urged to provide pattern equipment for the manufacture of this new design of bearing without delay.



Modified design of journal bearing specified by the A. A. R., Mechanical Division, for use during the present war emergency in order to conserve copper, tin and other critical materials

Class	Size Journal	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	R	S	T	U	V
		Dimensions in inches																			
A	3¾×7	1 29/32	6½	4¼	2	4 3/16	7/8	1 1/8	15/16	2	5½	2¾	½	1 5/8	3¾	¾	1 11/16	2	3 1/8	3 3/8	¼
B	4¼×8	2 5/32	7½	4 5/8	2 5/16	4 1/16	27/32	1 9/32	15/16	2 1/8	5 7/8	2¾	5/8	1¾	4 3/8	¾	2 1/16	2¼	3 5/8	3 7/8	¼
C	5×9	2 17/32	8½	5 3/8	3 1/8	5 3/8	1 1/32	1 7/32	1 1/16	2¼	6 7/8	3 1/8	11/16	2 1/16	4 7/8	7/8	2 7/16	2½	4 1/8	4 3/8	5/16
D	5½×10	2 25/32	9½	5 7/8	3 1/8	5 7/8	1 1/16	1 5/16	1 1/16	2 3/8	7 3/8	3 1/8	¾	2¼	5 3/8	7/8	2 15/16	2½	4 5/8	4 7/8	5/16
E	6×11	3 1/32	10½	6 7/8	3½	6 13/16	1¼	1½	1 3/16	2¾	8 3/8	4	13/16	2 7/16	6¼	1	3 5/16	2¾	5 1/8	5 3/8	3/8
F	6½×12	3 3/32	11½	7 3/8	4	7 5/16	1 7/16	1 9/16	1 5/16	3	8 7/8	4	7/8	2 5/8	6½	1 1/8	3½	3 3/8	5 5/8	5 7/8	3/8
		Permissible variations																			
Plus		1/32	1/32	1/32	1/32	1/16	1/32	3/64	1/16							1/32					
Minus		1/64	1/32	1/32	1/32	1/32	3/64	0	1/32							1/32					

One of the features of this modified design is that the marking has been revised to eliminate the initials of the purchaser. This is also intended to conserve critical metals, as it will eliminate the necessity for manufacturers carrying a large stock of bearings for different purchasers and bearing the purchaser's initials or markings.

The Mechanical Division letter urges that every effort be made to conserve copper and other strategic metals contained in journal bearings. Owing to the great number of these bearings constantly wearing out and being renewed, the possible aggregate savings are very large.

The manufacturers of journal bearings are requested to supply bearings of the modified design as soon as their pattern equipment can be changed. It is pointed out that it will take some time before these new patterns are available and, in the meantime, it will be permissible to accept bearings made to the former standard design.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. A. R. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Improper Repairs Covering Control Valve Not Sustained

On January 4, 1939, the Atlantic Coast Line, while giving periodic attention to air brakes on Pacific Fruit Express car No. 739 reported removing and replacing a Type U-12-B control valve. On July 6, 1940, the Atchison, Topeka & Santa Fe performed similar work on this car and reported a Type U-12 control valve removed and replaced although the car still carried the stencilling that was applied by the A. C. L. on the aforementioned date. The car owner entered a claim against the A. C. L. for an adjustment covering the difference in value between the two types of control valves under Item 20-C of Passenger Rule 21. In its statement the P. F. E. said that there was no record of a control valve having been removed from that car for any reason between the above two dates and the facts that this car still carried the A. C. L. stencilling was proof that the Type U-12 valve found on the car by the A. T. & S. F. was applied by the A. C. L. The A. C. L. contended that its records showed the car to have left its lines with the Type U-12-B control valve and if a U-12 valve was found on the car by the A. T. & S. F. it was evidently applied after the car left the A. C. L. rails. The A. C. L. declined the claim of the P. F E. on the ground that joint evidence was not secured within the time limit and that the defect card of the A C. L. would not perform the same function as joint evidence. The A. C. L. contended further that joint evidence should be required in similar cases to protect the repairing line.

In a decision rendered April 10, 1941, the Arbitration Committee stated: "Investigation disclosed P. F. E. car No. 739 was in home shops at Stockton, Calif., on May 19, 1939, and at Roseville, Calif. on March 12, 1940; in view of which the principle of Case No. 1742 applies. The contention of the P. F. E. is not sustained."—*Case No. 1783, Pacific Fruit Express versus Atlantic Coast Line.*

Charges Involved in Change of Wheels

The Ft. Worth & Denver City substituted two pairs of second-hand multiple-wear wrought-steel wheels under Wilson Car Lines car No. 7569 on June 10, 1940, and billed the owner $87.36 to which exception was taken on the ground that the substitution of multiple-wear wrought-steel wheels for one-wear wrought-steel wheels

standard to the car the charge should be based on A. A. R. prices but in no case to exceed the A. A. R. price for new one-wear wrought-steel wheels as covered by Rule 70, paragraph (d). The car owner claimed that under Rule 70, paragraph (d) the bill should have amounted to $62.76 on the basis of four new one-wear wrought-steel wheels less scrap credit for four one-wear wrought-steel wheels and that the repairing line had made an over charge of $24.60. The car owner further contended that the reporting line, in making the bill, should have used the gross price of one-wear wrought-steel wheels instead of the gross price of multiple-wear wheels. The Ft. W. & D. C. did not agree that Rule 70, paragraph (d) required that charges and credits for wheels exchanged must be on the basis of the wheels standard to the car as claimed by the owner and further that, according to its records, the car was not stencilled to show what wheels were standard, nor were there any marks found on the wheels which would identify them as one-wear wheels. This accounted for the fact that the wheels were reported as multiple-wear wheels, exchanged in kind, resulting in the charge of $87.36. Further investigation, however, developed that the wheels removed were stamped with one-wear identification and on this basis a revised bill was prepared amounting to a net value of $98.40 which, under Rule 70 was reduced to $81.88 representing the value of two pairs of new wheels.

In a decision rendered April 10, 1941, the Arbitration Committee ruled that, inasmuch as the charge for wheels applied should not exceed the cost of new wrought-steel wheels standard to the car, the contention of the Wilson Car Lines was sustained.—*Case No. 1784, Wilson Car Lines versus Fort Worth & Denver City.*

Air Brake Questions and Answers

(AB-8, Empty and Load Equipment Continued)

87—*Q.—What care should be taken of the brake cylinder piston, rod and non-pressure head assemblies?* A.—Covers or containers should be provided to protect the assemblies from dirt or damage when transporting to and from the car.

88—*Q.—What type cover should be recommended for this purpose?* A.—A bag made of canvas or similar material, large enough to cover the entire assembly, with a draw string at the top to exclude all dirt.

89—*Q.—What should be done before starting the repair or cleaning operation?* A.—Record the car number, owner and last cleaning date if needed for billing purposes. All old marks should be cleaned off and painted over with quick-drying black paint.

90—*Q.—What should be done next?* A.—Close the branch pipe cock and drain the air out of the auxiliary and emergency reservoirs and brake cylinder. Remove the cup from the dirt collector and leave it off until the cleaned valve portions are applied. Disconnect the release valve lever, leaving it attached to the release rods.

91—*Q.—What should follow?* A.—Blow any dirt or water out of the yard air line and supply hose connection to the car. If the brake tests are to be made by the same men who clean the brake, the single car tester should be coupled to the yard line and the car brake pipe at the B end of the car.

92—*Q.—What should be done after coupling up the test device?* A.—Charge up the brake pipe and blow it out.

93—*Q.—How should this be done?* A.—By opening the angle cock at the *A* end of the car, after which a dummy coupling is applied to the hose on this end of the car. Leave both angle cocks open.

94—*Q.—What else should be blown out at this time?* A.—Open the branch pipe cut-out cock to blow dirt from the branch pipe and then close it.

95—*Q.—What should be done before removing the valve portions from the car?* A.—Scrape or blow off all dirt close to the joint faces between the bracket and the valve portions, also from the portions and their bracket, hopper slopes, car underframes, etc. This is done in order to prevent any dirt from getting into the parts upon removal.

96—*Q.—What should be the procedure when removing the parts for cleaning?* A.—Remove the vent protector from the emergency portion and apply a manufacturer's standard vent protector plug (Fig. 3) then remove the emergency portion, immediately applying the spare shipping cap and tightening the holding nuts. (As the change-over valve of the AB-8 empty and load equipment is composed of three valve portions bolted together forming a unit, mounted on a single pipe bracket face, these three portions must be handled as a unit, when transporting to and from the car). Remove the service portion and the brake pipe strainer, immediately placing the strainer in the spare shipping cap, then apply the cap to the service portion and tighten its holding nuts. Remove the cap and wasp excluder from the retaining valve and do not replace them until after cleaning as will be explained later.

97—*Q.—What should be done before remounting the valve portions on the bracket?* A.—Using the necessary scrapers, loosen any dirt in the brake pipe passages, strainer chamber and other connecting passages of the pipe bracket and then, utilizing the blower hose equipped with a nozzle (See Fig. 1 Part No. 7) remove loose dirt from the retaining valve body and pipe by blowing from both the pipe bracket and the retaining valve ends, then blow the dirt from the face of the bracket, also the strainer chamber and the branch pipe passage toward the open dirt collector. The body gaskets must be properly cleaned and inspected to note that they are in good condition, those having flattened or broken beads, cuts or cracks should be rejected. The strut cylinder must be removed from its bracket on the truck bolster and if another cylinder is not to be applied at once, the bracket ports must be protected against the entrance of dirt. The strut cylinder hose and connections must be inspected for chafing and other damage leading to failure in service. This should include the hose clamps, cap screws and clamping nuts of the flanged fittings, the pipe supporting clamps and the bolts attaching the strut cylinder to the bolster.

98—*Q.—With the service and emergency portion gaskets in place on the pipe bracket, what should now be done?* A.—Remove the shipping cap from the clean emergency portion and mount it on the bracket at once. Coat the threads with graphite grease and tighten the holding nuts evenly.

99—*Q.—What should be done with the vent protector?* A.—Clean or renew the vent protector, applying it to the cleaned emergency portion.

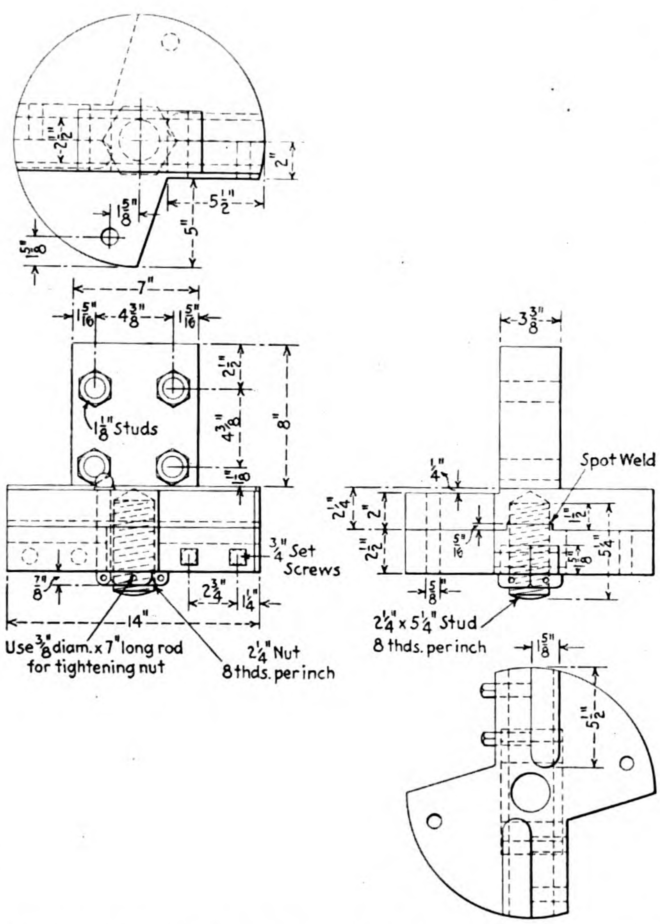
100—*Q.—What should be done next?* A.—Loosen the shipping cap on the service portion, remove the clean brake pipe strainer, and replace the shipping cap.

101—*Q.—How would you proceed to apply the strainer?* A.—Using a wood mandrel of suitable form for guiding the brake pipe strainer, place it in the pipe bracket and make sure that the inner end is in engagement with the sealing bead. Then apply the holding nut, tightening it with the special wrench provided.

Milwaukee Machine Shop Devices

Within the past year or more, a number of fine modern machine tools have been installed at the main locomotive repair shops of the Chicago, Milwaukee, St. Paul & Pacific, located at Milwaukee, Wis., and a definite effort has been made to equip these tools with the special jigs and fixtures needed for efficient handling of the various metal-removing operations. For example, on the Betts 100-in. boring mill, used for machining driving-wheel tires to fit the wheel centers, a double toolholder is used. This toolholder is shown equipped with a Vascoloy-tip tool which has just been used for roughing out the retaining ring groove. By loosening a nut underneath the toolholder, the lower part can be quickly indexed or turned through 180 deg., and the finishing tool brought into position to take the final finishing cut.

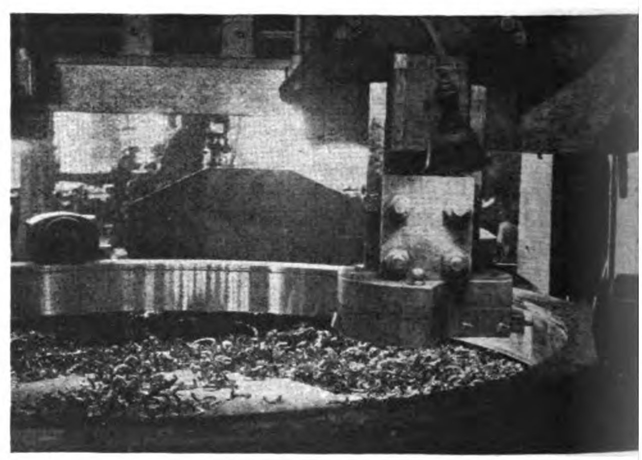
Referring to the drawing, it will be seen that this toolholder, made of billet steel, consists in the upper part of a circular plate, 14 in. in diameter by 2½ in. thick, with a section cut out on each side to accommodate the toolholder set screws and having a heavy vertical shank, 8 in. long, drilled with four holes for attachment to the boring-mill ram. This particular holder is designed for attachment to a solid ram, but may be readily made with a straight or taper shank for use on a mill having a hollow ram. The lower part of the toolholder is also made from a forged-steel plate, 14 in. in diameter by 2½ in. thick, which may be held accurately in either one of two 180-deg. positions with respect to the upper half of the holder by means of the tongue-and-groove construction indicated, and a plug or pin inserted through the desired indexing or positioning holes. The two parts of this double toolholder are held rigidly together when in use by means of a 2¼-in. stud and special hex-head nut. In boring tires with the cutting tool illustrated in this toolholder, the feed generally used is .015 in. per revolution and the surface cutting speed 176 ft. per min.



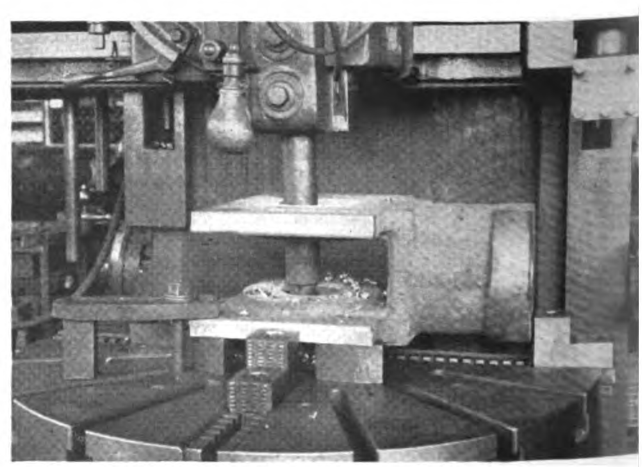
Details of special toolholder which is designed to hold a roughing and a finishing tool and may be indexed for use in either of two 180-deg. positions

On the Jones & Lamson turret lathe, the comparatively simple operation of turning and boring brass bushings is illustrated. These bushings are designed for use in connection with engine maintenance work on gasoline-electric rail cars and are turned to 3 in. outside diameter, with a 2-in. bore. A spindle speed of 1,000 r.p.m. and feed of .007 in. per revolution are used. The speed and feed changes are quickly made and cover a wide range on this J & L turret lathe, the indexing turret head and cross-slide tool post making all cutting tools available with minimum delay.

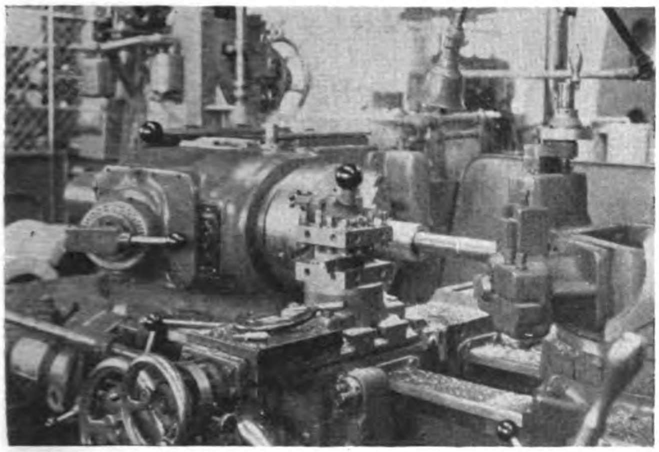
The other two illustrations show a King 40-in. boring mill, which is giving satisfactory service for a great variety of machining operations at the Milwaukee locomotive machine shop. The particular job shown on the boring-mill table is a crosshead which is being bored and subsequently reamed for the wrist-pin fit, two machine operations which can be accurately and quickly performed on this machine. Valve-chamber bushings are also turned and bored in this machine. The special tongs used in moving these bushings to and from the boring-mill table by means of the jib crane are illus-



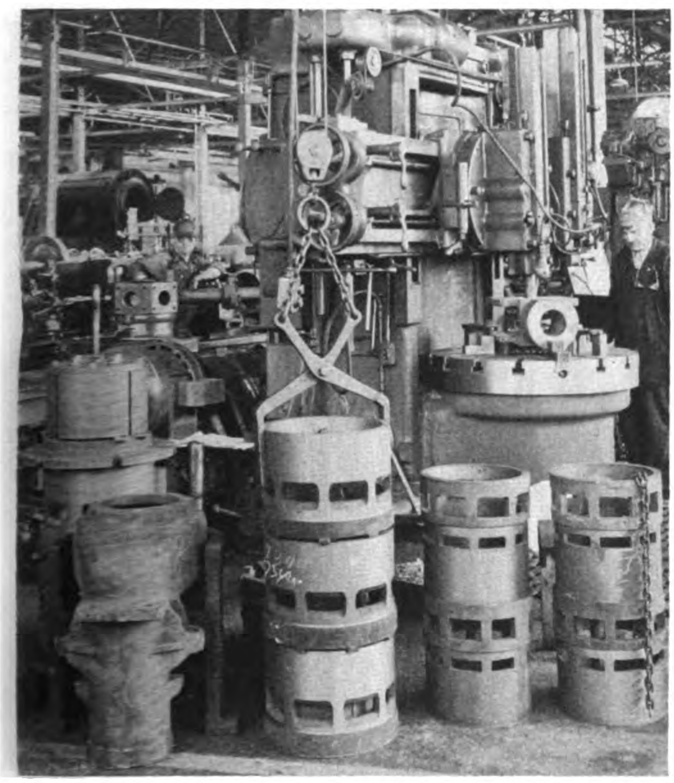
Toolholder used in boring driving-wheel tires on a Betts mill at Milwaukee shops



Cross-head set-up for boring the wrist-pin fit



J. & L. turret lathe finishing brass bushings for gasoline-engine reconditioning job



King 40-in. boring mill and some of the work which is done on it

trated. At the left of the bushings there is a special heavy semi-cylindrical steel jig with a flanged base which, when clamped on the boring mill table, greatly simplifies the setting up and holding of throttle boxes for machining the off-center hole and chamfered surfaces required for the main steam-valve seat. The box jig saves at least two hours in the set-up of this awkward piece of work. Above the throttle box in the illustration is an expanding mandrel used in the turning of main valve-packing rings.

In machining valve bushings, either 10, 12 or 14 in. in diameter, they are roughed out with all that the machine will carry, and then finished for accuracy. Special mandrels hold the bushings firmly centered on the boring-mill table. This machine has a wide range of feeds from $\frac{1}{98}$ in. to $\frac{1}{2}$ in. per revolution, the speed range being from 3 to 90 r.p.m. Various types of cutting tools, made with carbide and other special tool tips, are used dependent upon the kind of job being done. In general, the carbide-tip tools do not have sufficient shock resistance to perform satisfactorily in machining the ported section of the valve chambers or any similar job where the cutting is intermittent.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Calculating Booster Tractive Force

Q.—What additional tractive force can be obtained by applying a C-2 booster to a Pacific type locomotive having a working pressure of 225 lb.?—M. I. C.

A.—The A. A. R. formula for computing the tractive force for a locomotive booster is as follows:

$$T = \frac{C \times P \times D^{2} \times S \times r}{D}$$

where

T = tractive force, lb.
C = ratio mean effective pressure in cylinder to boiler pressure and is:
  .80 for 75 per cent cut-off booster
  .73 for 50 per cent cut-off booster
  .774 for 70 per cent cut-off booster
P = boiler pressure, lb. per sq. in.
d = diameter of cylinder, in.
S = stroke of piston, in.
D = diameter of booster driving wheels, in.
r = gear ratio

Assuming that the locomotive is to be equipped with a booster having the following characteristics:

cut-off, 75 per cent
cylinder diameter, 10 in.
stroke of piston, 12 in.
gear ratio, $\dfrac{36 \text{ number of teeth in axle gear}}{14 \text{ number of teeth in crankshaft gear}}$,

and the diameter of trailer wheel, 51 in.
then the tractive force of the booster would be

$$T = \frac{.80 \times 225 \times 10^2 \times 12 \times \frac{36}{14}}{51}$$

$$T = 10{,}891 \text{ b.}$$

Use of Steel Rivets in Aluminum

Q.—Is it satisfactory to use steel rivets for fabricating aluminum cabs, runboards, etc.?—R. S. K.

A.—There is no objection to using steel rivets in aluminum cabs or runboards. The rivets can be driven hot or cold. When driven hot, the rivets should be heated to about 1,800 deg. F. and driven with as little

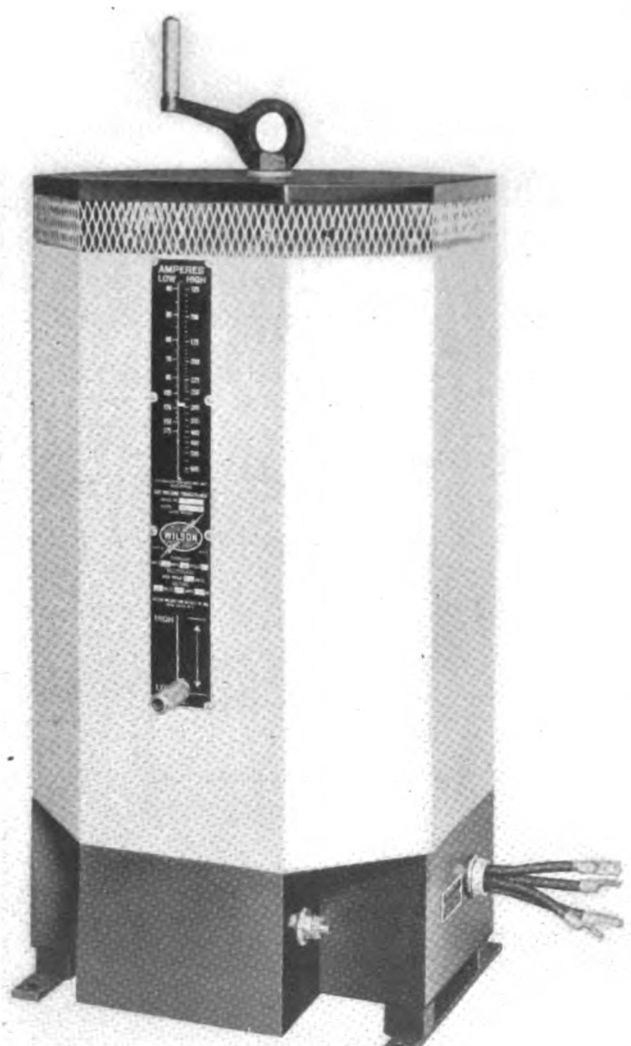
delay as possible so as to make the driving easier. Where a large group of hot steel rivets occur closely spaced, it is good practice to avoid overheating the adjacent metal, generally, the only precaution necessary is to drive at random rather than in succession.

The temperature of the aluminum alloy parts should not be allowed to exceed 400 deg. F. If these precautions are taken the strength of the aluminum alloy parts will not be affected appreciably and warping will be reduced to a minimum.

Steel rivets up to ¾ in. diameter have been successfully cold-driven in aluminum alloy structures. However, before driving, the rivets should be thoroughly annealed at about 1,300 deg. F. and should be cooled slowly in the furnace. Steel rivets should not be used on cabs unless they are to be painted as the rivet heads will rust.

Heavy-Duty Welding Units

Self-contained ac. transformer welders of 300-, 500-, 750- and 1,000-amp. capacities have been introduced by the Wilson Welder and Metals Company, Inc., New York. They can be adapted for use on 220, 440 or 550 volts, 25- or 60-cycle current. When arranged for 220- and 440-volt operation, single phase, either voltage can be brought into use, according to the manufacturer, by a reconnection of leads which are brought outside the unit.



Heavy-duty welder available in a wide range of capacities

A wide range of current output is claimed for these welders with continuous stepless current regulation provided over the entire range by means of a hand crank on top of the machine. Construction details of the machine and the method of insulation are said to provide cooler, trouble-free operation for longer periods of time even when operating continuously at maximum settings.

Twenty-five-cycle units are all fan-cooled, 60-cycle units are fan cooled except for the 300-amp. size. All 60-cycle units have high- and low-range switches, and power-factor correction on all except the 300-amp. size. Power-factor correction is not included on the 25-cycle models and they have only one operating range.

Known as Model TW these welders are said to have operating efficiencies of from 80 to 85 per cent.

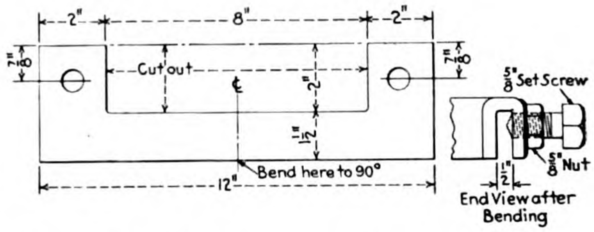
Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Clamp for Assembling Square Steel Boxes

Q.—I would like to have information relating to any device, such as a clamp, which can be used to hold plates when assembling steel boxes, cupboards and other square, welded articles.

A.—A handy corner clamp can be made as follows: Cut out of ⅜-in. plate a piece 12 in. long by 3½ in. wide. Then mark the center line of the 12-in. length. Mark off another line 1½ in. from one side of the piece, leaving 2 in. to the other side. From each end mark



Layout of clamp for holding corners of metal boxes square while welding

off 2 in. so that, as laid out the piece will now represent two 2-in. squares, a rectangle 1½ in. by 12 in. and another rectangle 2 in. by 8 in. Cut out this latter rectangular section, leaving two 2-in. by 2-in. ears at the end. An 1 1/16-in. hole is drilled at the center of each ear. The piece is now bent at the center line to exactly 90 deg. and the ears are bent over, leaving a space between the body of the clamp and each ear of about ½ in. A ⅝-in. nut is then welded over the hole in each ear and a ⅝-in. set screw turned into the nut. The clamp is now complete and to use it drop it over the

corner of the box or other article to be fabricated. It will hold the corners perfectly square while the welding is being done.

Reclaiming Inspirator Steam Valves

Q.—Near the bench where we repair inspirators is a box containing dozens of discarded forcer steam valves. These valves are all too short for use. Can they be saved?

A.—Forcer steam valves make an excellent application for the new wear-resisting bronze welding rod. There are one or two precautions that must be taken. File or grind the seat bright before attempting to build up with bronze. The operator will discover when brazing the first forcer valve that the end of the priming valve that hangs down inside the cage has a tendency to burn off. To avoid this, tear some asbestos paper into ½-in. strips and bind the end of the priming valve, this will prevent it from becoming overheated. Care should be taken when welding near the bars of the valve for these bars are light and melt very easily. Usually ½ in. to ¾ in. of new metal will be sufficient to insure a good seat, of desired height and free from pin holes.

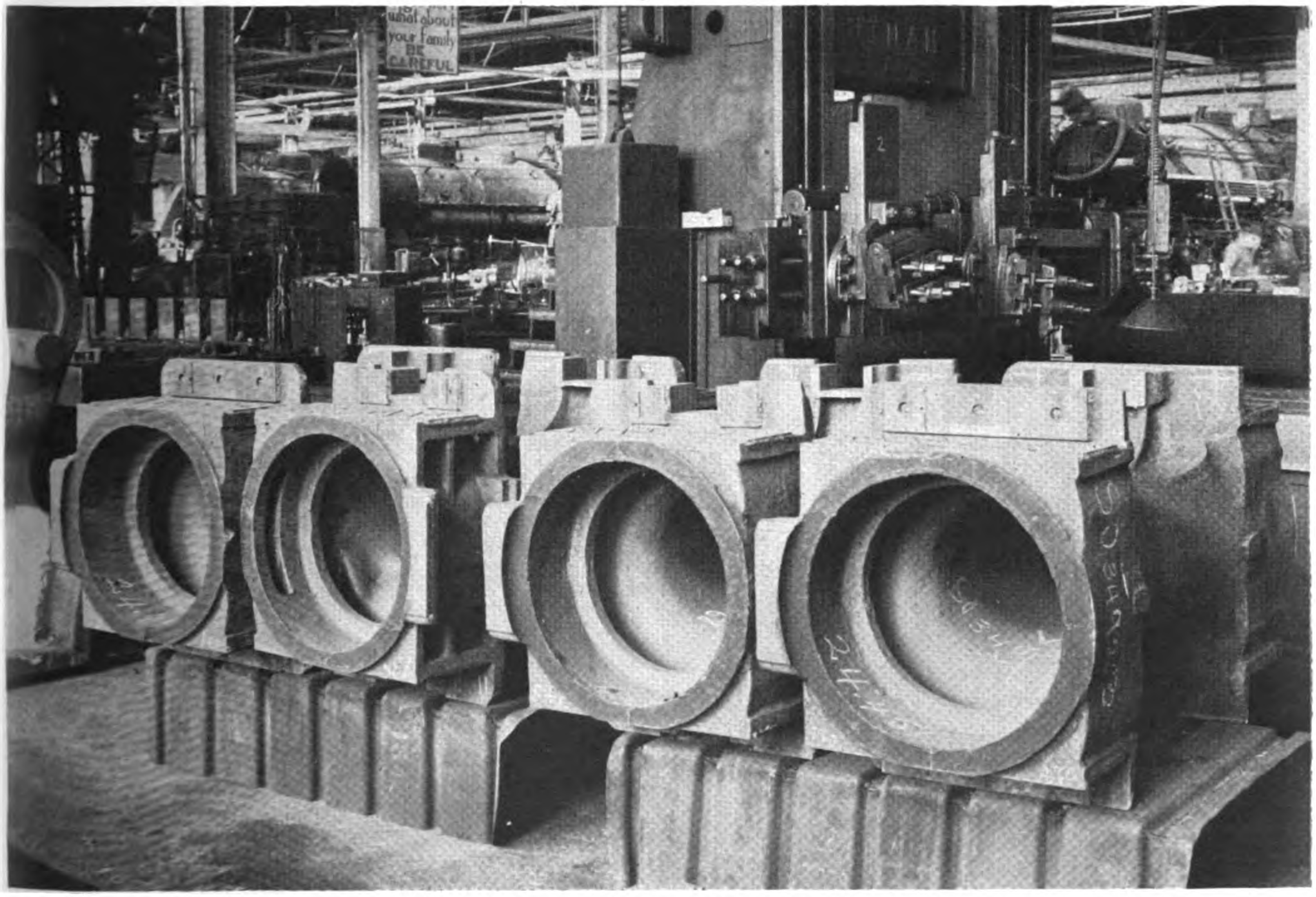
Locomotive Design Details Improved

Constant alertness and an intimate knowledge of locomotive operating and maintenance requirements are absolutely essential if railroads are to benefit from further improvements and refinements in design of motive power details. Several examples of what can be accomplished along this line were observed in a recent visit to the Milwaukee, Wis., shops of the Chicago, Milwaukee, St. Paul & Pacific.

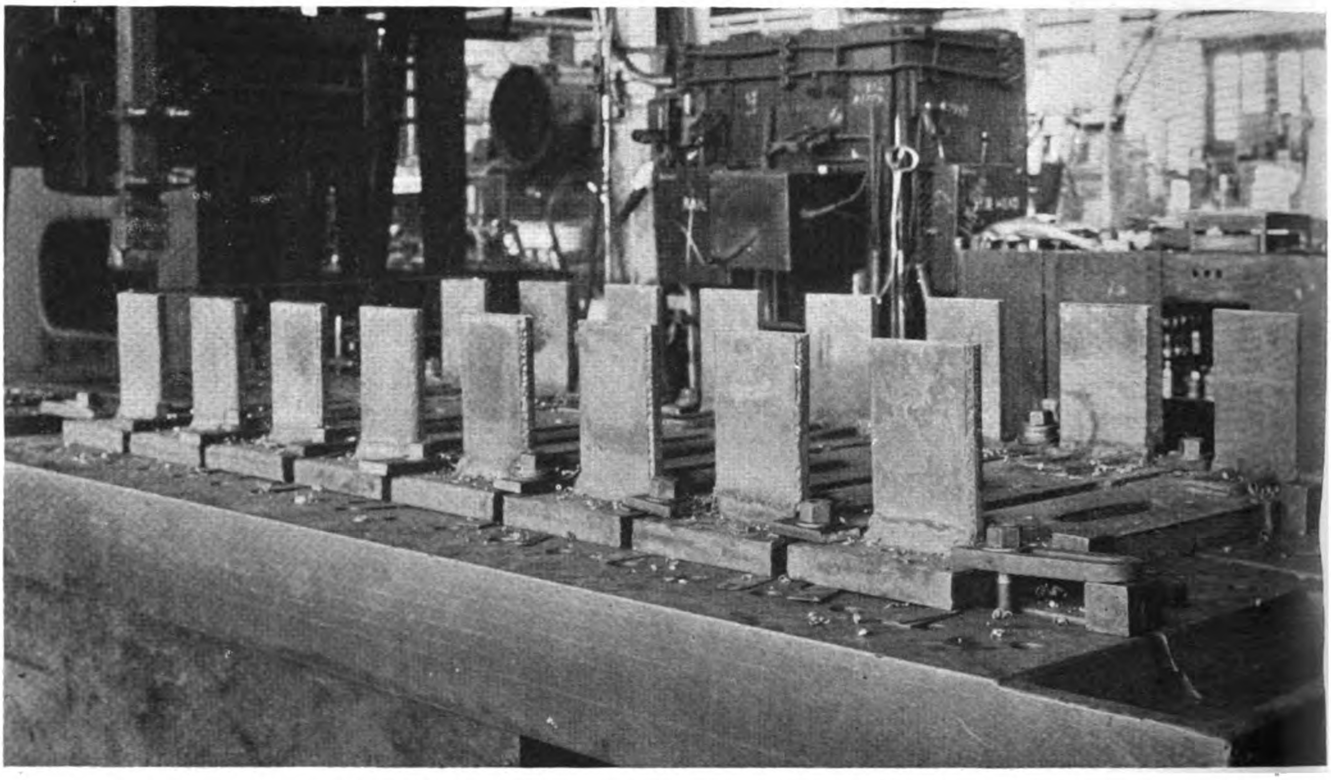
One instance, which might be cited, is the replacement of cast steel by built-up rolled-steel trailer caps for De Voy trailer trucks. These trailer caps are now fabricated completely by weding, and subsequently machined to bring all bearing surfaces in accurate position and alinement. The base is made of alloy billet steel and the wings of carbon boiler steel, with carborized plates welded on to resist wear on all bearing surfaces. This type of construction is said to be stronger, more wear resistant and less expensive than previous designs. The illustration shows a series of eight De Voy trailer-truck caps of the new design set up on a large planer table ready for the final machine operation.

Another interesting job was the redesign of a pair of front cylinder heads which avoided buying new ones.

Front cylinder heads reclaimed by a change in design which fills up excess clearance space when new lightweight pistons are applied



A set of roller-bearing housings ready to be machined before being assembled on main locomotive driving axles

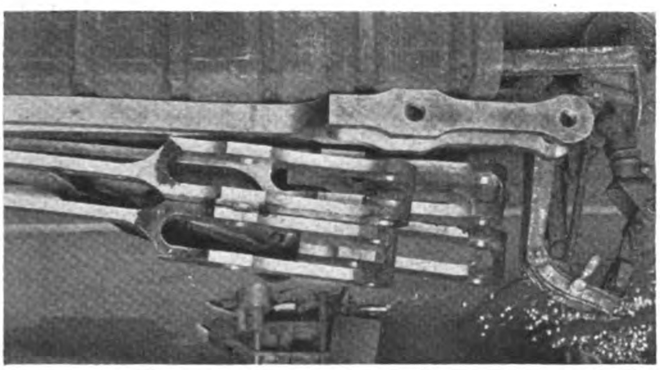


Fabricated De Voy trailer-truck caps set up on a planer ready for machining

when new lightweight rods and pistons were applied to a locomotive. These cylinder heads were reclaimed by building them up so as to fill the additional clearance space provided by the new piston design. Conical extension plates were simply formed in a die and welded to the old cylinder head. These heads were then reapplied to the locomotive and are now giving excellent service.

Another slight change in practice, made possible by the use of the mechanical gas-cutting machine and designed simply to facilitate doing more accurate work in the machine shop, is shown in one of the illustrations. All that was done in this case was simply to leave a small section of metal at the extreme end of the radius bar, so as to tie together the sides of the long clevis section and hold them in accurate alinement while the clevis is being machined and the link pin holes bored and reamed. Without this tie, it is necessary to apply blocking which may not always be easily held in place and without which there is sufficient spring in the sides of the clevis so that it is difficult to do the machine work with accuracy and smoothness. With the present arrangement, as soon as the machine operations on the clevis end of the radius bar are finished, the end ties are cut out and the radius bar completed to blueprint.

Another illustration shows a set of four roller bearing housings for locomotive main driving axles, mounted on skids and ready to be machined for application of the roller-bearing units.

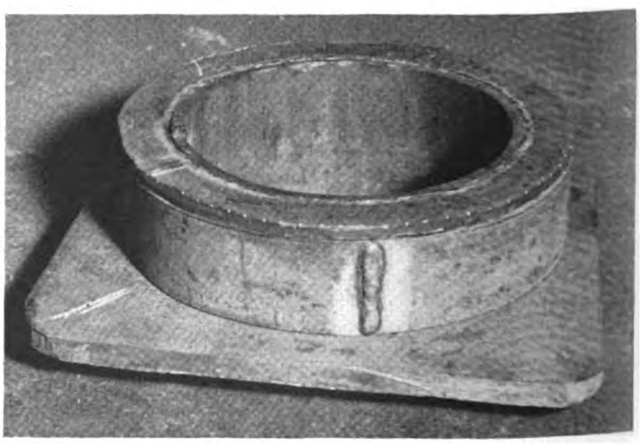


Ties left in radius-bar ends during machining operations promote accuracy and smoother work

Fabricating All Steel Front End Parts by Welding

The construction of a welded steel stack is simple, in fact a boilermaker and helper without any special equipment can cut, roll and prepare for welding the entire assembly in about seven hours. The welding takes even less time than this.

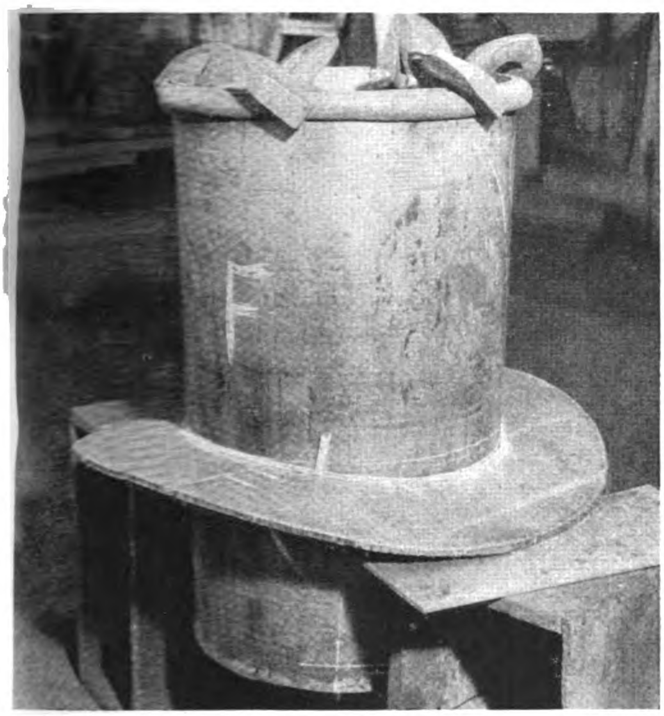
The body of the stack is made from 3/8-in. tank steel and is rolled in one piece, the taper varies slightly with the different types of locomotives but is generally about 1 in. in 12 in. The smoke-stack flange is torch cut to



The completed ring blower, before drilling

size, its diameter being about 10 in. larger than the diameter of the stack. The flange is rolled to the curve of the smoke box, the center or smoke stack fit is then cut out with the torch. The flange is located in its proper position on the stack and tacked in place. A piece of 1½-in. half oval stock is rolled into a circle to fit the top of the stack and this is tacked in place. All that is needed to complete the stack is to weld on the four pieces of 2-in. angle iron that are used to hold the stack and petticoat together in the smoke box.

The petticoat, or draft pipe, is a little more difficult to roll due to its abrupt taper. The method used with the best results and the greatest accuracy being to use ordinates spaced a couple of inches apart and keeping them parallel with the rolls at all times during the



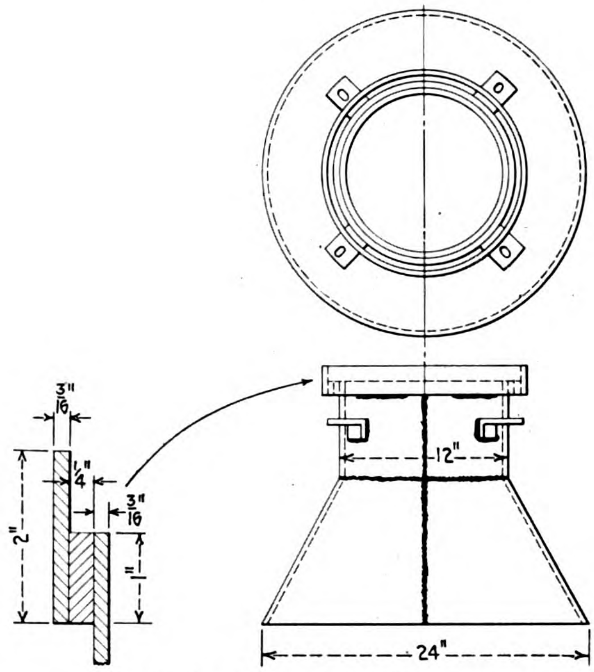
A locomotive stack fabricated by welding

rolling. After the skirt of the extension is rolled, the top is rolled to fit and tacked to the skirt. Two pieces of band iron are needed for the joint at the top of the petticoat, one piece of $\frac{3}{16}$-in. by 2-in. and one piece ¼-in. by 1-in., these pieces are rolled and welded to the top to make a guide for the bottom of the stack when lining them in position.

Many front ends are so constructed that it becomes necessary to remove part of the skirt of the draft pipe because of the lack of space between the back plates and the stack. When this condition exists, the needed amount is torch cut from the skirt and a flat plate substituted. Four pieces of 2-in. angle with slots in them are welded to the pipe the same as the stack and these bolting lugs are slotted to take a ¾-in. bolt and are welded all around.

Another example of fabricated steel replacing cast iron is found in the all-welded steel exhaust-tip ring blower. The construction of the part embodies simple shearing, rolling and welding technique.

The base is a square of ½-in. boiler plate made the same outside dimensions as the top of the exhaust base. The center of this plate is flame cut to a diameter $1\frac{3}{16}$ in. larger than the desired inside measurement of the tip. A strip of ⅜-in. plate is rolled to the proper inside diameter and taper according to print. This is assembled in the opening of the base piece leaving enough protruding through the bottom to machine a suitable seat. It is then welded. A ring is rolled and welded



Details of the welded draft pipe

together to form the outside of the tip. This ring is made from ¼-in plate, spaced equidistant, and welded inside and out. The ring for the top is sheared or flame cut to size, laid in place and welded securely.

Four triangular pieces are welded to the top of the tip to create pockets in the exhaust to entrap the front-end gases. A 1½-in. pipe nipple is welded to the side of the tip as a steam inlet. The blower is completed with eight $\frac{3}{16}$-in. holes drilled in the top. The completed tip is taken to a lathe where the seat is faced off square with the base. When the bolt holes are drilled the all-welded tip is ready to be placed in service. With the steel exhaust tip it is a simple matter to decrease or increase the size of the tip.

The completed stack and draft pipe

High Spots in

Railway Affairs . . .

Eastman's Job

Joseph B. Eastman, director of the Office of Defense Transportation, is building up his organization and is going steadily forward in trying to remove handicaps from the paths of the common carriers in their efforts to more effectively handle the heavy defense and war traffic. He has made it quite plain on several occasions that he does not intend to interfere with them, but rather hopes to co-operate in such a way that their efforts can be more intelligently co-ordinated, to the end that production and orderly distribution in this country be not interfered with. In an address before the National Council of Private Motor Truck Owners he made this statement: "Fortunately we all have the same aim, namely, to win the war. I have received most gratifying and unanimous offers of co-operation on the part of both carriers and shippers, including the government agencies. I have every expectation that they will make good on those offers."

Public Aid to Carriers

One of the most disturbing elements in the problem of fair regulation of competing common carriers by the government is the extent to which they are given public aid and just who profits from some of the subsidies or aids that are extended to particular classes of carriers. The Board of Investigation and Research created by the Transportation Act of 1940, and which will die next September unless its life is extended by the President, has announced that a study will be made on public aids to the railways, highways and waterways. This it is said, will be closely related to the recently announced tax study. "Insofar as possible and to the extent practicable within the time allotted for the study," says the announcement, "an effort will be made to subdivide the public aids to each kind of transport by regions, and by distinguishable groups of users. Since it is important as a guide to public policy that the benefits realized or believed to have been realized from public aids be thoroughly analyzed, the projected study, in addition to estimating the extent of the aids, will inquire as fully and as specifically as possible into the benefits."

Pilfering on Trains

The Railway Gazette of London publishes a column summarizing answers to questions asked in Parliament affecting transportation. One of these related to the stealing of towels on trains. Col. J. J. Llewellin, joint Parliamentary secretary, Ministry of War Transport, made this reply: "Precise information is not available, but I am told that the loss of towels, soap, etc., through pilferage is large. The difficulty in obtaining replacements has resulted in the curtailing of the supply of these articles on trains, and if pilfering continues it may become impossible for the railways to continue to provide these requirements."

Urges Public Ownership Of Rights of Way

The fact that the railroads own their own rights of way, while other types of carriers operate over rights of way furnished and maintained by the government, has made the problem of treating them on an equitable basis exceedingly difficult. The National Resources Planning Board has been making studies of a rather ambitious nature, with a view to stabilizing economic conditions in post-war years. Its plans, apparently, include great public works projects and the extensive rebuilding or reorganization of facilities in cities. Through its Transportation Section it has just made a report on transportation problems and future development. The President has transmitted this to Congress. The report urges government ownership of all rights of way of transportation agencies and points out that because the railroads, unlike other agencies, now own their own rights of way, "both the planning of an overall transportation system and the profitable investment of public capital are thwarted; and exclusion of the railroads from a large-scale public works program accentuates the problem of unequal promotional policies, hence an uneconomic distribution of traffic."

Co-operation from Shippers

One of the outstanding developments over the past two decades has been the cultivation of better relations and more intelligent co-operation between the shippers and the railroads. The remarkable success which the railways are having in handling the present heavy traffic is due in no small part to this fact. In a way it is reflected in a reply made by Joseph B. Eastman to a question asked by Representative Houston in a recent hearing before a subcommittee of the House Appropriation Committee. The Congressman suggested that the railroads might speed up the unloading of freight cars by increasing the demurrage charges. In reply Mr. Eastman expressed the opinion that the railroads could get more help from the shippers in car utilization by their voluntary co-operation than by further penalizing demurrage.

Ten Per Cent Fare Increase

The Interstate Commerce Commission moved at a fast pace after closing the rate hearings. On January 21 it granted the railroads and certain water carriers authority on 10 days' notice to increase their passenger fares approximately 10 per cent. This was done on the basis of increased wages to employees, increased cost of materials and supplies, and additional expenditures to safeguard their properties and operations during the present emergency. This increase does not affect fares specially published for application to members of military or naval forces of the United States on furlough, nor does it affect fares published as extra fares, applicable in connection with transportation on particular trains. It is expected that the Commission will shortly grant an increase in freight rates. That problem, however, is not so simple as that of adjusting passenger rates, which can more readily be done on a flat percentage basis.

Non-Defense Spending Should be Drastically Cut

The nation was heartened near the close of the year by the report of the Joint Congressional Committee on the Reduction of Non-Essential Federal Expenditures, under the chairmanship of Senator Byrd of Virginia. It recommended drastic cuts in non-defense federal activities. At about the same time the Brookings Institute released a report, suggesting the reduction of such expenditures by more than two billion dollars, and this without affecting essential social services. "The government can set an example for the people in this critical hour," says the Brookings study, "by practicing the rigid economies which the national situation imperatively requires. Although non-essential private construction which is already under way is being abandoned, so that men and materials will be available for the war effort, much federal non-defense construction is still proceeding." The study suggests that flood control, rivers and harbors, and other waterway projects could be cut by $350,000,000 and highway development by $171,000,000. There is also pending in Congress a Rivers and Harbors Bill which would authorize construction of non-defense public works costing very nearly $1,000,000.

Among the Clubs and Associations

NORTHWEST CAR MEN'S ASSOCIATION.—Meeting February 2, 8 p. m., at The Midway Club, St. Paul, Minn. Discussion of proposed changes in A. A. R. Rules of Interchange.

NORTHWEST LOCOMOTIVE ASSOCIATION.—Meeting February 16, 8 p. m., Woodruff Hall, St. Paul, Minn. Safety night. Speakers: Safety superintendents of northwest railroads.

ANTHRACITE VALLEY CAR FOREMEN'S ASSOCIATION.—Meeting February 16, 6:30 p. m., Hotel Redington, Wilkes-Barre, Pa. Discussion 1942 A. A. R. Book of Rules. Entertainment.

WESTERN RAILWAY CLUB. — Meeting February 2, 8 p. m., Hotel Sherman, Chicago. Speaker: Jos. E. Barzynski, Brigadier General, Q. M. C., Chicago. Subject: Defense for America! Motion picture talkie.

CANADIAN RAILWAY CLUB.—Meeting February 9, 8:15 p. m., Windsor Hotel, Montreal, Que. Speaker: J. C. Long, western sales manager, Franklin Railway Supply Co., Inc., Chicago. Subject: Franklin steam distribution system with O. C. poppet valves.

NEW ENGLAND RAILWAY CLUB.—Meeting February 10, 6:30 p. m., Hotel Touraine, Boston, Mass. Speaker: Leicester S. Johnston, Major, Chemical Warfare Service, United States Army. Subject: Function of Air Raid Precaution Services.

CAR DEPARTMENT ASSOCIATION OF ST. LOUIS.—Meeting February 17, at 8 p. m., at the Hotel DeSoto, St. Louis, Mo. Speaker: R. K. Betts, general car foreman, Pennsylvania. Subject: "How the Carmen Can Help Keep Them Rolling."

DIRECTORY

The following list gives names of secretaries, dates of next regular meetings, and places of meetings of mechanical associations and railroad clubs:

ALLIED RAILWAY SUPPLY ASSOCIATION.—J. F. Gettrust, P. O. Box 5522, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — C. E. Davies, 29 West Thirty-ninth street, New York. Annual meeting Hotel Astor, New York, December 1-5.
RAILROAD DIVISION.—E. L. Woodward, *Railway Mechanical Engineer*, 105 West Adams street, Chicago.

ANTHRACITE VALLEY CAR FOREMEN'S ASSN.—Frank Kramer, 412 Hill street, Duryea, Pa. Meets third Monday of each month at Wilkes-Barre, Pa.

ASSOCIATION OF AMERICAN RAILROADS.—Charles H. Buford, vice-president Operations and Maintenance Department, Transportation Building, Washington, D. C.
OPERATING SECTION.—J. C. Caviston, 30 Vesey street, New York.
MECHANICAL DIVISION.—A. C. Browning, 59 East Van Buren street, Chicago.
PURCHASES AND STORES DIVISION.—W. J. Farrell, 30 Vesey street, New York.
MOTOR TRANSPORT DIVISION.—George M. Campbell, Transportation Building, Washington, D. C.

CANADIAN RAILWAY CLUB.—C. R. Crook, 4415 Marcill avenue, N. D. G., Montreal, Que. Regular meetings, second Monday of each month, except June, July and August, at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT ASSOCIATION OF ST. LOUIS.—J. J. Sheehan, 1101 Missouri Pacific Bldg., St. Louis, Mo. Regular monthly meetings third Tuesday of each month, except June, July and August, DeSoto Hotel, St. Louis.

CAR DEPARMENT OFFICERS' ASSOCIATION.—Frank Kartheiser, chief clerk, Mechanical Dept., C. B. & Q., Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 8238 S. Campbell avenue, Chicago. Regular meetings, second Monday in each month, except June, July and August, La Salle Hotel, Chicago.

CAR FOREMEN'S ASSOCIATION OF OMAHA, COUNCIL BLUFFS AND SOUTH OMAHA INTERCHANGE.—H. E. Moran, Chicago Great Western, Council Bluffs, Ia. Regular meetings, second Thursday of each month.

CENTRAL RAILWAY CLUB OF BUFFALO.—Mrs. M. D. Reed, Room 1840-2, Hotel Statler, Buffalo, N. Y. Regular meetings, second Thursday of each month, except June, July and August, at Hotel Statler, Buffalo.

EASTERN CAR FOREMAN'S ASSOCIATION.—W. P. Dizard, 30 Church street, New York. Regular meetings, second Friday of January, February (annual dinner), March, April, May, October, and November at Engineering Societies Bldg., 29 West Thirty-ninth street, New York.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—R. A. Singleton, 822 Big Four Building, Indianapolis, Ind. Regular meetings, first Monday of each month, except July, August and September, in Indianapolis Union Station, Indianapolis, at 7 p. m.

LOCOMOTIVE MAINTENANCE OFFICERS' ASSOCIATION.—Secretary-treasurer C. M. Lipscomb, Missouri Pacific, North Little Rock, Ark.

MASTER BOILER MAKERS' ASSOCIATION.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

MID-WEST AIR BRAKE CLUB.—C. F. Davidson, secretary-treasurer, general inspector car department, St. L.-S. F., Springfield, Mo.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meetings second Tuesday in each month, except June, July, August and September.

NEW YORK RAILROAD CLUB.—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Thursday in each month, except June, July, August, September and December at 29 West Thirty-ninth street, New York.

NORTHWEST CAR MEN'S ASSOCIATION.—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meetings first Monday each month, except June, July and August, at Midway Club rooms, 1931 University avenue, St. Paul.

NORTHWEST LOCOMOTIVE ASSOCIATION.—G. T. Gardell, 820 Northern Pacific Building, St. Paul, Minn. Meetings third Monday of each month, except June, July and August.

PACIFIC RAILWAY CLUB.—William S. Wollner, P. O. Box 3275, San Francisco, Cal. Monthly meetings alternately in northern and southern California.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1647 Oliver Building, Pittsburgh, Pa. Regular meetings, fourth Thursday in month except June, July and August, Fort Pitt Hotel, Pittsburgh, Pa.

RAILWAY FUEL AND TRAVELING ENGINEERS' ASSOCIATION.—T. Duff Smith, Room 811, Utilities Building, 327 South La Salle street, Chicago.

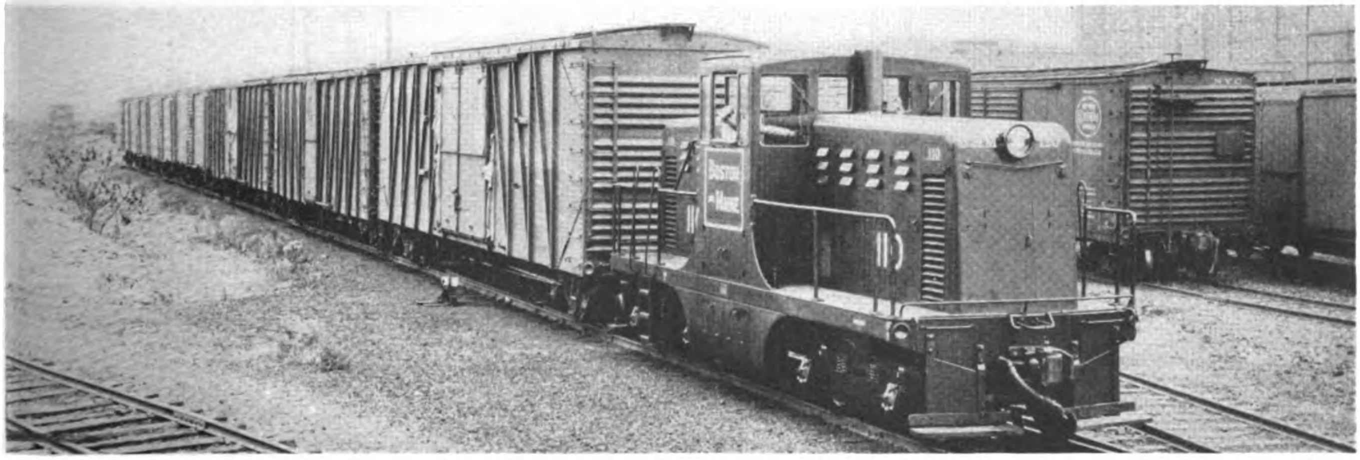
RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1941 Oliver Building, Pittsburgh, Pa.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings, third Thursday in January, March, May, July and September. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

TORONTO RAILWAY CLUB.—D. M. George, Box 8, Terminal A, Toronto, Ont. Meetings, fourth Monday of each month, except June, July, and August at, Royal York Hotel, Toronto.

WESTERN RAILWAY CLUB.—E. E. Thulin, executive secretary, Room 822, 310 South Michigan avenue, Chicago. Regular meetings, third Monday in each month, except June, July, August, September, and January.

* * *



A 44-ton Diesel-electric switcher built by General-Electric and powered by two Caterpillar engines handling cars on the Boston & Maine

NEWS

Railroad Estimates of 1942 Steel Needs

ESTIMATES of the requirements of the railroads and car and locomotive builders during the twelve months of 1942 have been revised by the roads and submitted to the Office of Defense Transportation. The figures, made available after a meeting of the Special Purchasing Committee of the Purchases and Stores Division, A. A. R., held in Washington, D. C., on Wednesday, January 21, had been requested by Director Joseph B. Eastman.

The estimates of the steel required by the railways and equipment builders include the materials previously estimated for the program of 36,000 freight cars to be built by May 1, in addition to the 9,000 which were expected to be built during January; these are included with 121,827 freight cars and 974 locomotives which it is now proposed to build before the end of the year. This includes 29,046 cars to be built in railroad shops and 62,781 cars to be built in the shops of equipment builders and delivered by October 1, and 30,000 cars to be built in railroad and contract shops for delivery between October 1 and the end of the year. The locomotives include 364 steam, 558 Diesel-electrics, 33 electrics, and 19 other types. The iron and steel products required for this program are set forth in the table which is shown below.

"Unfinished Rainbows"

A NEW technicolor sound movie, produced by the Wilding Picture Productions, Inc., in both 16- and 35-mm., for the Aluminum Corporation of America, Pittsburgh, Pa., is a dramatization of the history of the aluminum industry in America. It is presented as an example of what may be accomplished when "unfinished rainbows" are tackled with the courage and determination displayed by Charles Martin Hall in his woodshed laboratory and by the early leaders in the industry which followed the development of the electrolytic process for the production of aluminum. It dramatizes the struggles of the industry to develop markets for the material and is brought up to date by a presentation of the defense efforts now being made by the producers of the metal.

Throughout, the film implies that there are other "unfinished rainbows" awaiting the youth of today who have the requisite vision and persistence.

Eastman Appoints Division Heads of ODT

ON January 8, January 14 and January 16 Joseph B. Eastman, director of the Office of Defense Transportation, announced the appointments of a number of division directors and other assistants. The newly appointed division heads and assistants are:

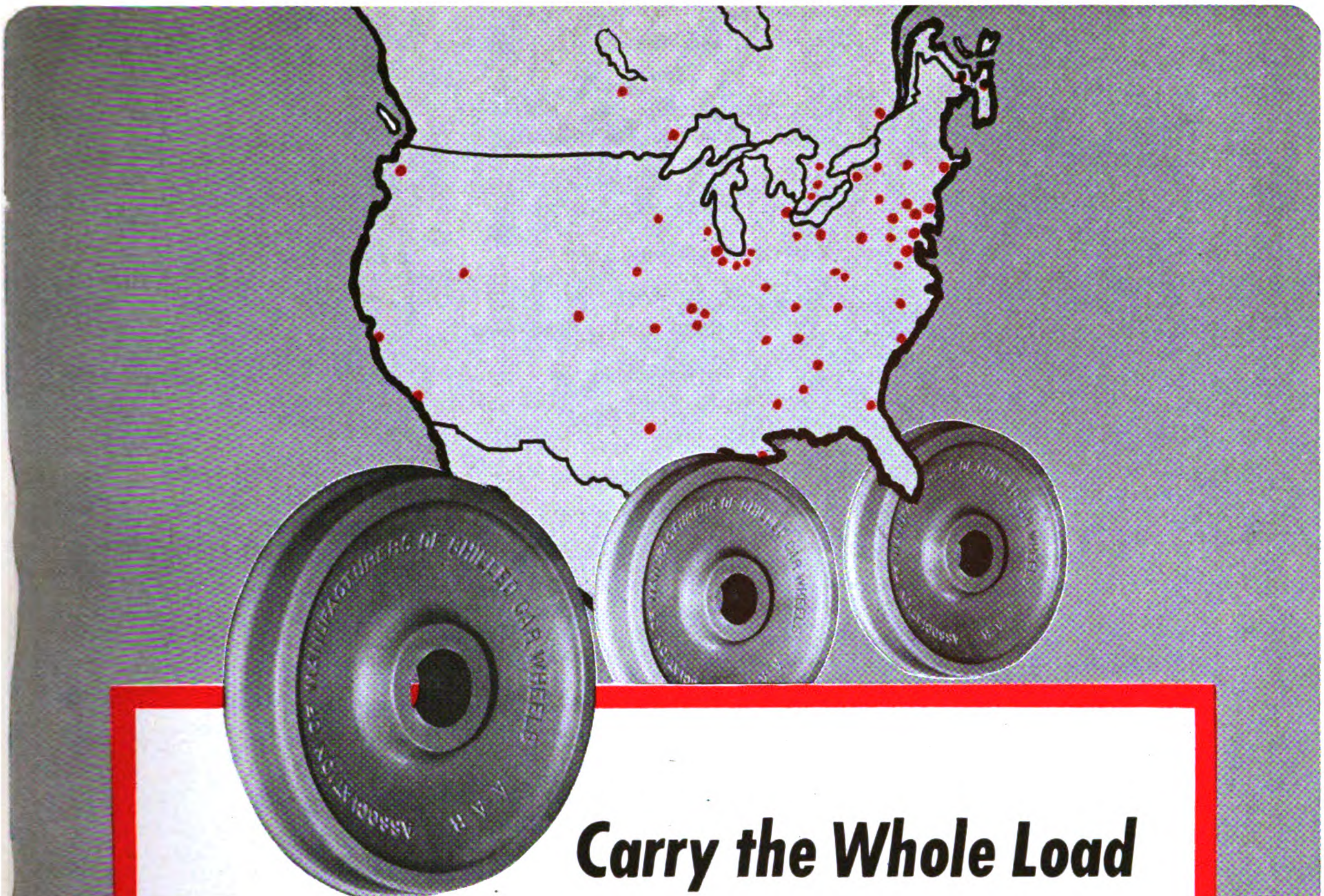
Division of	Headed by
Railway Transport	Victor V. Boatner, director; formerly president of the Chicago Great Western.
Motor Transport	John L. Rogers, director; member I. C. C.
Traffic Movement	John R. Turney, director; formerly vice-president law and traffic, St. Louis-South Western. Henry F. McCarthy, associate director; passenger traffic manager, Boston & Maine. Samuel W. Fordyce, assistant director, to head the Section of War Traffic; assistant to the president, K. C. S. Walter Bockstahler, assistant director, to head the Section of Traffic Channels; formerly vice-president Keeshin Freight Lines.

(Continued on next left-hand page)

Iron and Steel Products to Be Acquired Through Purchase for Delivery During 1942 for Railroads, Car Builders and Locomotive Builders—Net Tons

	Plates, shapes, bar, sheets, billets, roofs, doors, ends, fabricated and pressed steel parts, etc.	Side Frames	Bolsters	Couplers and Yokes	Draft Gears	Other Castings	Axles	Loco. Tires	Wheels One Wear	Wheels Multi-Wear	Crank Pins	Piston Rods	Other Forings	Bolts, nuts, washer, tubes, flues pipe, nails, springs, etc.
Railroad Maintenance ...	847,418	31,447	14,465	54,600	36,934	103,782	43,524	57,893	24,802	85,401	5,983	2,372	26,605	265,877
New Cars														
For Delivery to October 1, 1942														
Railroad Shops	306,891	30,850	21,679	17,829	7,781	18,812	43,901	141	25,638	12,642	....	....	3,938	25,367
Car Builders.	536,104	56,209	37,014	28,867	14,879	16,908	83,647	....	24,307	....	....	....	31,141	32,463
For Delivery October to December, 1942	354,780	38,400	25,500	19,200	10,500	15,750	52,530	....	18,360	....	....	....	16,170	24,300
New Locomotives..	77,337	....	....	740	254	75,417	6,723	32,531	....	6,583	566	290	9,790	20,298
Grand Total....	2,122,530	156,906	98,658	121,236	70,348	230,669	230,325	90,565	93,107	104,626	6,549	2,662	87,664	368,305

	Rail (Net Tons)	Track Fastenings	Frogs and switches guard rails, etc.	Steel for bridges, buildings, etc.	Grey Iron Castings	Malleable Castings	Pig Iron	Scrap Iron & Steel	Grand Total
Railroad Maintenance.........	1,632,394	887,883	103,262	137,046	33,812	14,125	10,979	4,028	4,424,632
New Cars									
For Delivery to October 1, 1942									
Railroad Shops	......	......	......	......	197	975	6	....	516,647
Car Builders	......	......	......	......	....	....	....	....	861,539
For Delivery October to December, 1942	......	......	......	......	....	....	....	....	575,490
New Locomotives	......	......	......	......	3,490	786	....	....	234,805
Grand Total	1,632,394	887,883	103,262	137,046	37,499	15,886	10,985	4,028	6,613,113



Rates	G. Lloyd Wilson, director; professor of transportation and public utilities, University of Pennsylvania.
Transport Personnel	Otto S. Beyer, director; member of the National Mediation Board.
Storage	Leo M. Nicholson, director; Chicago real estate and warehouse operator.
Local Transport	Guy A. Richardson, director; former president of the Chicago Surface Lines and receiver for the Chicago Railways Co.
Inland Waterway Transport	Edward Clemens, director; vice-president, Mississippi Valley Barge Line.
Section of Materials and Equipment	Col. C. D. Young, director, vice-president in charge of real estate, purchases, and maintenance, Pennsylvania.

Other appointments made by Mr. Eastman are: Executive assistant: Joseph L. White, consultant on transportation problems; General counsel: Jack G. Scott, chief of the Legal and Enforcement Section of the I. C. C. Bureau of Motor Carriers; Assistant on pipe lines, tankers, tank cars, and tank trucks: Fayette B. Dow; Assistant on Great Lakes Carriers: A. T. Wood.

The Section on Materials and Equipment, of which Colonel Young is head, was created, Mr. Eastman said, because of the direction of the president that ODT "stimulate the provision of necessary additional transport facilities and equipment in order to achieve the level of domestic transportation service required." Mr. Eastman explained that he had called the organization of which Colonel Young is head "a section, instead of a division, because it will supply the staff work on materials and equipment for my carrier divisions, but Colonel Young will report directly to me."

In his first press conference on January 8 Mr. Eastman said that the greatest danger he now foresees is that the carriers may not be able to get materials for new equipment and repairs. That "looms up as a special danger to the automotive branch of the industry," although "it applies to all." Mr. Eastman foresees that there may be a tendency not to realize that "commercial and civil transportation is an integral part of the defense mechanism." Efficient transportation, he insisted, "is just as important to war production as machine tools; if transportation should bog down, that would be reflected immediately in the war effort."

Nelson Heads War Production Board

APPOINTMENT of a War Production Board with Donald M. Nelson as chairman was announced by President Roosevelt on January 13. The new board, the announcement said, "will be granted the powers now exercised by the Supply Priorities and Allocations Board, and Mr. Nelson in addition to being chairman, "will be charged with the direction of the production program and will have general supervision over all production agencies"; his decision "as to questions of procurement and production will be final."

A Million Loadings by May

ESTIMATING that weekly carloadings will reach a level of about one million cars as early as May this year, the Supply Priorities and Allocations Board early in January authorized the Office of Production Management to grant priorities for the construction by that time of 36,000 freight cars, in addition to the 9,000 which were expected to be built during January. The program was recommended by Leon Henderson, director of OPM's Division of Civilian Supply, and Joseph B. Eastman, director of the Office of Defense Transportation; and, as SPAB sees it, the cars thus provided would "just permit the roads to meet this peak at full operating efficiency."

As to locomotives, OPM was authorized to grant priorities for the continued production through April of locomotives "now on order or now scheduled for production for stock, consisting of 248 steam locomotives, 58 electric locomotives, and 620 Diesel locomotives."

In the freight car program preference will be given "to types needed to transport military equipment"; while the locomotive program provides that those built for stock "be of a type and size suitable for military or foreign use, and that Diesel locomotive production must not interfere with deliveries of Diesel engine crankshafts for military use."

Orders and Inquiries for New Equipment Placed Since the Closing of the January Issue

LOCOMOTIVE ORDERS

Road	No. of Locos.	Type of Locos.	Builder
Chesapeake & Ohio	15[1]	0-8-0	Lima Loco. Works
Chilean Nitrate Sales Corp.	8	40-ton Diesel-elec.	General Elec. Co.
National Steel Co. of Brazil[2]	2	2-8-2	H. K. Porter Co.
	4	0-6-0	
	3	0-4-0	
Sanderson & Porter Co.	2	45-ton Diesel-elec.	General Elec. Co.
Southern	2	5,400-hp. Diesel-elec. frt.	Electro-Motive Corp.
Stone & Webster Co.	1	80-ton Diesel-elec.	General Elec. Co.
Wabash	1	1,000-hp. Diesel-elec.	Baldwin Loco. Wks.

LOCOMOTIVE INQUIRIES

Road	No. of Locos.	Type of Locos.	Builder
Argentine State Rys.	10-15	4-6-2	....
New York Central	25	4-8-2	....
Petroleos Mexicanos	2	2-8-2	....

FREIGHT-CAR ORDERS

Road	No. of Cars	Type of Cars	Builder
Atlantic Coast Line	1,100	50-ton box	Pullman-Std. Car Mfg. Co.
	400	50-ton hopper	Bethlehem Steel Co.
	300	50-ton gondola	
	100	70-ton covered phosphate	
	100	50-ton flat	Greenville Steel Car Co.
Chesapeake & Ohio	1,000[3]	50-ton hopper	American Car & Fdry. Co.
Louisville & Nashville	750	50-ton hopper	American Car & Fdry. Co.
	500	50-ton box	
	100	70-ton covered hopper	
	400	50-ton box	Pullman Std. Car Mfg. Co.
	750	50-ton hopper	
	100	50-ton box	
	225[4]	50-ton box	
	500	50-ton hopper	Pressed Steel Car Co.
	100	50-ton flat	Mt. Vernon Car Mfg. Co.
Pittsburgh & West Virginia	100	50-ton box	Company shops

FREIGHT-CAR INQUIRIES

Road	No. of Cars	Type of Cars	Builder
Argentine State Rys.	50	9,500-gal. tank	....
Baltimore & Ohio[5]	1,000	50-ton box	....
	1,000	50-ton hopper	....
Chicago & North Western[5]	1,000	50-ton gondolas	....
	500	50-ton box	....
	250	50-ton flat	....
	25	50-ton cement	....
Chicago, Rock Island & Pacific	300	50-ton auto-box	....
	300	50-ton flat	....
	150	50-ton hopper	....
	25	70-ton covered hopper	....
Detroit, Toledo & Ohio	50	50-ton flat	....
	70	50-70-ton gondola	....
Grand Trunk Western	200	40-ton box	....
New York, Chicago & St. Louis	25	Caboose	....
Pere Marquette	250	70-ton flat	....
Southern	2,500	50-ton hopper	....
	1,000	50-ton gondola	....

[1] Cost approximately $1,257,000.
[2] Order unconfirmed.
[3] Reported cost, $2,560,000.
[4] For the Atlanta & West Point.
[5] Inquiry unconfirmed.

(*Turn to next left-hand page*)

Nelson Announces WPB Organization; OPM Abolished

REORGANIZATION of the government's war production set-up, involving abolition of the Office of Production Management, was announced on January 21 by Donald M. Nelson, chairman of the new War Production Board created by President Roosevelt in an executive order signed January 16. WPB also supplants the Supply Priorities and Allocations Board, although the former SPAB members continue as WPB members.

Railroad requirements for materials will continue to be handled through a Civilian Supply Division, which, like its OPM predecessor, will be headed by Leon Henderson. However, Mr. Nelson said that "we must keep the transportation system sound, and moving the goods; if we don't, and transportation breaks down, the program breaks down."

Mr. Nelson's organization has six major divisions. Their names and chiefs are as follows: Purchases, Douglas MacKeachie; Production, W. H. Harrison; Materials, William L. Batt; Industry Operations, J. S. Knowlson; Labor, Sidney Hillman; Civilian Supply, Leon Henderson. Priorities, formerly handled in the OPM Priorities Division, will now be handled in the Division of Industry Operations. Also, Mr. Nelson has set up a Requirements Committee, headed by Mr. Batt, which will handle the allocation of raw materials; and a planning unit which, as the WPB chairman put it, "will think through how the job can be done better."

80,502 Freight Cars, 633 Locomotives Installed in 1941

CLASS I railroads in 1941 put 80,502 new freight cars in service, the largest number installed in any year since 1929, according to the Association of American Railroads. This was an increase of 14,957 compared with the number of new freight cars put in service in 1940; in 1929, the railroads installed 84,894 new freight cars.

New freight cars installed in 1941 included 44,807 box, 30,938 coal, 1,752 flat, 2,200 refrigerator, 149 stock and 656 miscellaneous cars. Class I railroads on January 1, 1942, had 74,897 new freight cars on order, "the largest number at the beginning of any year since the compilation of these records began 20 years ago." New freight cars on order on January 1, 1941, totaled 35,702. New freight cars on order at the beginning of this year included 46,300 box, 23,638 coal, 1,400 refrigerator, 2,191 flat, 300 stock and 1,068 miscellaneous cars.

New locomotives installed in service in 1941 by the Class I roads totaled 633, of which 161 were steam and 472 were electric and Diesel-electric. This was the largest number put in operation since 1930. In 1940, there were 419 new locomotives put in service, of which 126 were steam and 293 were electric and Diesel-electric.

New locomotives on order on January 1, 1942, totaled 546, which included 258 steam and 288 electric and Diesel-electric. On January 1, 1941, there were 206 on order, of which 115 were steam and 91 were electric and Diesel.

Equipment Purchasing and Modernization Programs

Chicago & North Western.—A contract has been awarded the T. S. Leake Construction Company, Chicago, for the construction of a machine-shop addition to the enginehouse at Proviso yards, Proviso, Ill., for servicing large locomotives. The addition will be approximately 50 ft. by 75 ft. in size, of brick and steel construction.

Northern Pacific.—The Northern Pacific has asked the Interstate Commerce Commission for authority to assume liability for $1,800,000 of equipment trust certificates, maturing in 10 equal annual installments of $180,000 on February 16, in each of the years from 1943 to 1952, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $2,275,000 and consisting of 500 70-ton, all-steel, Hart Selective ballast cars; four 1,000-hp. Diesel-electric switching locomotives, and two 660-hp. Diesel-electric switching locomotives.

Springfield & Southwestern.—This newly-formed company has asked Interstate Commerce Commission authority to issue 50 shares of common capital stock of a par value of $100 and 10 unsecured notes aggregating $55,000. The notes will bear interest at the rate of five per cent, will mature on December 31 in each of the years from 1947 to 1951, inclusive, and the funds will be used to purchase rolling stock and equipment of the Chicago, Springfield & St. Louis in Springfield, Ill.

Union Pacific.—Additional enginehouse facilities are being constructed at Green River, Wyo., at a cost of approximately $144,000. The work includes the construction of one additional engine stall 178 ft. in length, the lengthening of two existing stalls to 178 ft., the extension of five other stalls to make them 156 ft. long, and the installation of a 75-ton electric drop table and pit extending across three stalls to replace the present drop table and pits. A contract amounting to $80,000 has been awarded the James Leck Company, Minneapolis, Minn., in connection with this work.

Wabash.—The Wabash has been authorized by the district court to spend $1,315,223 for the maintenance of right of way and additions and betterments. Included are $489,509 for the purchase of new freight cars and the rehabilitation of 150 old ones.

75 Percent of 1942 Equipment Already on Order—Pelley

ON January 6 at Chicago, J. J. Pelley, president of the Association of American Railroads, declared that 85,000, or 75 per cent of the 113,000 freight cars which the railways have committed themselves to buy in 1942, were then on order and added that 9,000 of these cars would be delivered in January, 10,500 in February, and 12,500 during March.

Concerning locomotive deliveries, he said that these would be somewhat slower but that 1,000 units are on order and these should be delivered in ample time for requirements. Of the 1,000 units on order, he said that 630 are steam for main-line service and the remainder are Diesel-electric, mostly for yard and switching service.

* * *

The new "Empire State" on the New York Central

(Turn to next left-hand page)

Supply Trade Notes

H. L. Hamilton, president of the Electro-Motive Corporation, has been elected a vice-president of the General Motors Corporation.

◆

J. Rogers Davis, who joined the Chicago Pneumatic Tool Company in December, has been appointed supervisor of branches, a newly created office, to assist in the sales activities of the company's district and sub-district offices.

◆

Frank L. Murphy has been appointed chief engineer of the Pullman-Standard Car Manufacturing Company, in charge of all engineering of railway cars and transit equipment, with headquarters at the Pull-

Frank L. Murphy

man Car Works, Chicago. Mr. Murphy was born in Chicago on November 25, 1900, and graduated in mechanical engineering from Purdue University in 1922. He immediately entered the railway car manufacturing field as a freight-car draftsman for Pullman and has continuously served the Pullman organization since that time, devoting most of his effort in recent years to the passenger-car field. In January, 1928, he became assistant to the passenger-car engineer. In 1932, and for a number of years, he specialized in adapting mechanical air conditioning to both Pullman and railroad cars. In 1935, he was appointed principal engineer at the Pullman Car Works, and in 1940 assumed the duties of acting chief engineer.

◆

Baldwin Locomotive Works.—Four divisional vice-presidents have been appointed as follows: *Haldwell S. Colby*, locomotive division; *Frank K. Metzger*, Standard Steel Works division; *Frederick G. Schranz*, Baldwin-Southwark division, and *Norris H. Schwenk*, Cramp Brass and Iron Foundries division. The duties of these men will remain substantially the same as in the past. Other appointments in the company's locomotive division include that of *Amos G. Cole* as works manager, and *Lewis W. Metzger* as production manager, reporting to Mr. Colby. *Ralph W. Anderson*, formerly superintendent of motive power of the Chicago, Milwaukee, St. Paul & Pacific, has been appointed assistant to Mr. Colby, with particular reference to steam-locomotive construction.

◆

McKenna Metals Company.—*Bennett Burgoon, Jr.*, formerly mechanical engineer of the Railway Steel Spring division of the American Locomotive Company at Latrobe, Pa., has been appointed representative for the McKenna Metals Company at Rockford, Ill. *W. L. Kennicott*, previously sales manager at Los Angeles, Calif., is now at Latrobe, Pa., in the management of sales and engineering of Kennametal tools and their applications.

◆

Copperweld Steel Company.—The Copperweld Steel Company has opened a district office at 122 South Michigan avenue, Chicago, under the supervision of *W. W. Ege*, who has been appointed western sales manager. Heretofore, Copperweld sales activities in this district have been handled by Steel Sales Corporation's Copperweld department in charge of Mr. Ege. Copperweld territorial representatives in the Chicago district are as follows: *E. G. Elg*, assistant western sales manager, Chicago; *J. P. Gould*, Chicago; *H. V. Rathbun*, Kansas City, Mo.; *A. B. Leach*, St. Louis, Mo.; *R. C. Raasch*, Des Moines, Iowa, and J. J. Healy, Minneapolis, Minn.

◆

W. Edgar Hamsher, service engineer of the Hennessy Lubricator Company, has been appointed vice-president. Prior to joining the Hennessy Lubricator Company in 1923, Mr. Hamsher had been employed with the Pennsylvania at Chambersburg, Pa.

◆

Oakite Products, Inc.—Two new divisions, closely correlated and supplementary to the railway service division, have been

T. R. Smith

added to the nation-wide field service staff of Oakite Products, Inc. The New England division, with headquarters in Hartford, Conn., is headed by *T. R. Smith*, division manager, who will supervise the activities of the eleven men comprising this division. The second new division is the St. Louis and Southwestern division, which will make its headquarters in St. Louis, Mo. *S. C. Shank* has been selected to fill the post of division manager and direct the activities of the twelve men of this division. Mr. Smith has served for the

S. C. Shank

past 16 years as an Oakite service representative in a major Eastern industrial area, while Mr. Shank has covered a Mid-Western territory since 1930.

◆

Frank A. Streiff has been appointed southeastern sales manager of the Southern Wheel division of the American Brake Shoe & Foundry Co., with headquarters at Portsmouth, Va., from which point he has represented the Southern Wheel and Brake Shoe and Castings divisions of this company since 1935. Mr. Streiff will continue to represent the Brake Shoe and Castings division.

◆

Jerry C. Bloomfield has severed his connection with the Bettendorf Company and has been appointed district representative at Chicago for the Standard Car Truck Company.

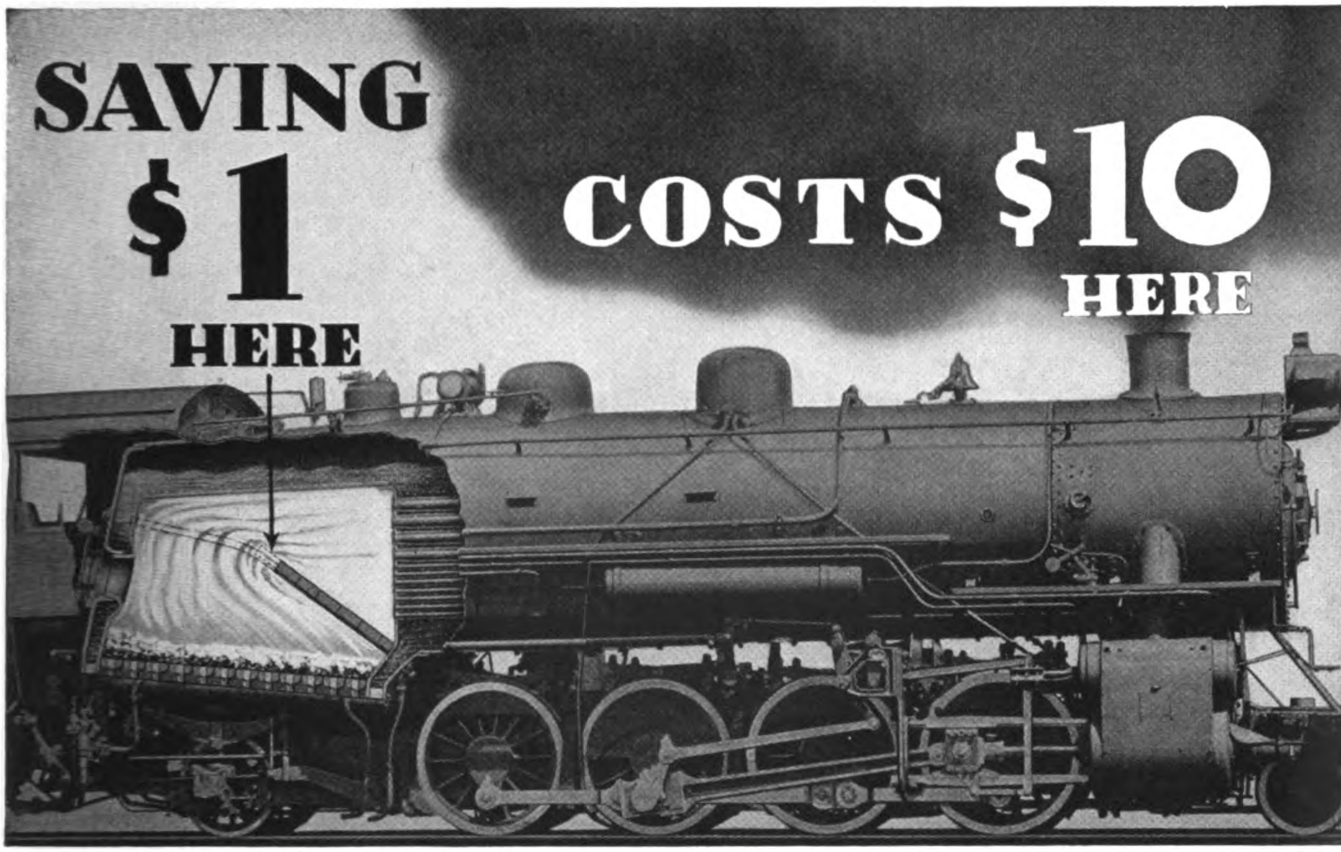
◆

L. J. Garber has been appointed a representative of the Buffalo Brake Beam Company and the Unit Truck Corporation, with headquarters at St. Louis, Mo.

Obituary

George H. Goodell, manufacturers' agent at St. Paul. Minn., for the Q & C Co., the Cullen-Friestedt Company, the Northwestern Motor Car Company, the National Lock Washer Company, the Edgewater Steel Company, the Standard Car Truck

(*Continued on next left-hand page*)


SAVING
$1
HERE
COSTS $10
HERE

Company and the Standard Railway Equipment Company, died in that city on December 27.

◆

CLAUDE C. CUEMAN, a designer of locomotives for the American Locomotive Company, died December 28 at his home in Ridgewood, N. J. He was 61 years of age.

◆

GEORGE COOK KIMBALL, a director and executive vice-president of the United States Steel Corporation, a director and president of the Illinois Steel Company, and a director and executive vice-president of the Carnegie-Illinois Steel Corporation, with headquarters at Chicago, died on January 12 at the Passavant hospital in that city after an illness of about a year. Mr. Kimball was born at Newtonville, Mass., on October 13, 1879, and graduated from Harvard University in 1900. The following year he entered the steel industry in the engineering department of the American Tin Plate Company at Pittsburgh, Pa., and in 1905 was appointed chief engineer of the American Sheet & Tin Plate Co. In 1931, he was elected a vice-president and in June, 1932, was elected vice-president of the Illinois Steel Company, with headquarters at Chicago. When the Carnegie-Illinois Steel Corporation was formed

George Cook Kimball

in 1935, Mr. Kimball became executive vice-president in charge of the Chicago district and in April, 1939, he was elected executive vice-president at Chicago of the United States Steel Corporation.

◆

ERNEST LUNN, mechanical engineer of the Super-Gear Drive Corporation, Chicago, and at one time electrical engineer of the Pullman Company and later of the Pullman - Standard Car Manufacturing Company, died at his home in Chicago on January 6, after an illness of about a week.

◆

ARTHUR AIGELTINGER, vice-president of the American Brake Shoe & Foundry Co., New York, died on December 30. Mr. Aigeltinger began his career with the Manganese Steel Rail Company in 1908, holding successively the positions of chief engineer, vice-president and president. In 1918 he retired from that company to become vice-president of the American Malleables Company, of which he was president from 1922 until its dissolution in 1936. Meanwhile, he had been appointed assistant to the president of American Brake Shoe & Foundry, the parent company, in 1929. He was elected vice-president in 1934.

Personal Mention

General

GEORGE H. EMERSON, chief of motive power and equipment of the Baltimore & Ohio at Baltimore, Md., who retired on January 1 as announced in the January issue, entered railway service in 1880 as water boy on the Willmar division of the Great Northern and in April, 1882, became an apprentice at the St. Paul shops. In October, 1887, he became a boilermaker and from September, 1890, to February,

George H. Emerson

1895, served as fireman and engineer, Dakota division. Mr. Emerson was locomotive foreman at Glasgow, Mont., from 1895 to 1897, then becoming general shop foreman and master mechanic, Dakota and Northern divisions. In January, 1900, he was appointed general master mechanic of the Western district and in 1903 became superintendent motive power. He was appointed assistant general manager of the Great Northern in March, 1910, and general manager in October, 1912. From October, 1917, to January, 1920, Mr. Emerson was Colonel in command, Russian Railway Service Corps in Siberia. He was appointed chief of motive power and equipment of the Baltimore & Ohio in March, 1920.

HOWARD HILL, master mechanic of the Philadelphia (Pa.) division of the Reading who has been appointed assistant superintendent of motive power and rolling equipment at Reading, Pa., as announced in the

Howard Hill

January issue, was born at Philadelphia, Pa., on June 15, 1890. He entered the service of the Reading as a machinist in 1914, at Philadelphia. He was promoted to assistant foreman in 1917; to enginehouse foreman at Philadelphia on January 1, 1933; assistant master mechanic on September 1, 1936, and to master mechanic of the Philadelphia division on July 1, 1938.

JOHN J. TATUM, assistant chief of motive power and equipment of the Baltimore & Ohio at Baltimore, Md., who retired on

John J. Tatum

January 1, as announced in the January issue, was born at Baltimore, Md., on September 17, 1866, and entered railroad service in 1879 as messenger boy in the Mount Clare shops of the Baltimore & Ohio. For a few years he worked in the locomotive building and repair shops, but in

1881 he became an apprentice in the car department and in 1885 became a car builder. Later he served in various supervisory capacities in the car department and in 1907 was appointed superintendent of freight-car equipment. During government control of the railroad during the first World War Mr. Tatum was manager of the car repair section of the United States Railroad Administration. On March 1, 1920, he returned to the Baltimore & Ohio as superintendent, car department, in charge of both passenger and freight equipment. He was appointed general superintendent of the car department on June 1, 1925, and on June 14, 1937, was appointed assistant chief of motive power and equipment. Mr. Tatum was elected chairman of the Mechanical Division, A. R. A., in June, 1924. He holds many patents and copyrights for improvements to railroad equipment. A few of his accomplishments are discussed in the item published on page 458 of the October, 1941, *Railway Mechanical Engineer,* at the completion of his seventy-fifth birthday and his sixty-second year of consecutive service on the B. & O.

Ernest P. Gangewere, assistant superintendent of motive power and rolling equipment of the Reading, who has been promoted to superintendent of motive power and rolling equipment of the Reading and Central of New Jersey, with headquarters

Ernest P. Gangewere

at Reading, as announced in the January issue, was born at Bethlehem, Pa., on November 17, 1900, and attended high school at Chattanooga (Tenn.). During 1917 and 1918 he worked as an apprentice in the machine shop of the Wheland Machine Company at Chattanooga and later attended Lehigh University, receiving the degree of mechanical engineer in 1922. Mr. Gangewere entered the service of the Reading in July, 1922, as a special apprentice on the staff of the assistant superintendent motive power, subsequently becoming motive-power inspector. During this time he completed an air-brake instruction course with the International Correspondence Schools. In 1925, he was promoted to mechanical supervisor and from 1927 to 1933 served successively as enginehouse foreman at Saucon Creek, Bethlehem, Pa., and assistant master mechanic at Philadelphia, Pa. In 1933, he was appointed assistant superintendent of the Reading locomotive shop and on January 1, 1930 was appointed assistant superintendent of motive power and rolling equipment.

George H. Massy, division master mechanic on the Central of New Jersey, with

George H. Massy

headquarters at Jersey City, N. J., who has been promoted to the position of assistant superintendent of motive power and rolling equipment, at Elizabethport, N. J., as announced in the January issue, was born at Jamaica, British West Indies, on April 25, 1889. He entered the service of the Central of New Jersey as a helper apprentice on March 25, 1908, and was promoted to machinist in 1910. In 1916, he became assistant foreman, Bayonne (N. J.) enginehouse; on August 1, 1925, enginehouse foreman at Elizabethport engine terminal; on March 17, 1926, general mechanical inspector, New York; on March 1, 1929, assistant master mechanic at Communipaw (N. J.) engine terminal, and on January 1, 1933, division master mechanic in charge of the Central and Southern sub-divisions.

H. T. Cover, superintendent of the Wilkes-Barre division of the Pennsylvania with headquarters at Sunbury, Pa., has been promoted to superintendent of

H. T. Cover

freight transportation, Eastern region. Mr. Cover was born at Altoona, Pa., on August 25, 1897, and entered railway service in August, 1915, with the Pennsylvania, serving for two weeks as laborer at Altoona. He then served successively as boilermaker helper in the Juniata shops, draftsman in the office of the general superintendent motive power, special apprentice in the Altoona machine shop, motive power inspector, assistant shop foreman on the New York division, foreman on the same division, shop foreman on the Philadelphia Terminal division and at the East Altoona enginehouse. On January 1, 1931, Mr. Cover became assistant master mechanic of the Maryland division, and was promoted to master mechanic of the Buffalo division on November 1, 1934, being transferred to the Maryland division on April 16, 1937. He served as master mechanic of the Columbus, Cincinnati and Toledo divisions from July 1, 1939, to January, 1940, when he was promoted to superintendent of the Wilkes-Barre division at Sunbury.

R. C. Hempstead, district master mechanic of the Chicago, Milwaukee, St. Paul & Pacific, at Milwaukee, Wis., has been promoted to the position of assistant superintendent of motive power, with the same headquarters. Mr. Hempstead was born at Nevada, Iowa, on August 5, 1884, and entered railway service on the Chicago & North Western in May, 1900, as an enginehouse laborer, later serving as machinist apprentice, machinist and enginehouse foreman. From 1910 to 1912 he served as a machinist on the Northern Pacific; the Minneapolis, St. Paul & Sault Ste. Marie, and the Minneapolis & St. Louis. He re-

Ralph C. Hempstead

turned to the North Western in the latter year as enginehouse foreman at Norfolk, Neb. On January 1, 1913, Mr. Hempstead went with the Milwaukee as a machinist at Chicago, later being promoted to enginehouse foreman at Tomahawk, Wis., and Wausau. In September, 1918, he was promoted to master mechanic of the Hastings and Dakota division, with headquarters at Aberdeen, S. D., and a year later was transferred to Madison, Wis. In September, 1920, he was transferred to Ottumwa, Iowa, and in March, 1927, was transferred to Dubuque, Iowa. Mr. Hempstead was appointed superintendent of the Milwaukee (Wis.) locomotive shops and foundries in November, 1928. In August, 1933, his title was changed to district master mechanic, with headquarters at Milwaukee, and his jurisdiction was extended to include the Milwaukee, Superior and Madison divisions.

(Turn to second left-hand page)

GUARD

ON LAND, on sea, and in the air, America's armed forces are "ON GUARD" defending the lives and property of our people. Behind the lines, the fastest possible movements of men, equipment and supplies are vital.

General Motors Diesel locomotives in all classes of service are playing an important part. Since one tank car of fuel oil in a GM Diesel Switcher will do the work of twelve cars of oil or coal in a steam switcher, and since GM Diesel locomotives in all classes of service are replacing two to four times as many steam locomotives, thousands of freight cars and hundreds of steam locomotives are available for other service.

MODERNIZE TO MOBILIZE WITH GM DIESELS

VE DIVISION

LA GRANGE, ILLINOIS, U. S. A.

Master Mechanics and Road Foreman

W. B. JONES has been appointed acting master mechanic of the Utah Railway, with headquarters at Provo, Utah.

RICHARD KLING has been appointed assistant master mechanic on the Missouri Pacific at Kansas City, Mo.

J. N. FOX, master mechanic on the Illinois Central at Jackson, Tenn., has been appointed superintendent of equipment at Chicago.

J. L. MADENFORT, enginehouse foreman on the Reading at Newberry Junction, Pa., has been promoted to the position of master mechanic of the Shamokin division at Tamaqua, Pa.

J. S. FENNELL, JR., master mechanic of the Shamokin division on the Reading at Tamaqua, Pa., has been promoted to the position of master mechanic of the Philadelphia division at Philadelphia, Pa.

D. L. MCMILLAN, assistant master mechanic at the Markham terminal (Chicago) of the Illinois Central, has been appointed master mechanic at Champaign, Ill.

M. G. STEWART, assistant road foreman of engines of the Williamsport division of the Pennsylvania, has been promoted to road foreman of engines of the Washington Terminal company.

R. F. SMALLEY, general foreman on the Central of New Jersey at Communipaw engine terminal, Jersey City, N. J., has been appointed division master mechanic in charge of the central and southern subdivisions, with the same headquarters.

W. J. COLCORD, assistant road foreman of engines of the Maryland division of the Pennsylvania, has been promoted to road foreman of engines of the Delmarva division.

M. H. LOSCH has been appointed master mechanic of the Illinois and Missouri divisions and the Dupo terminals of the Missouri Pacific and of the Missouri-Illinois with headquarters at Dupo, Ill.

F. L. KING, enginehouse foreman on the Chicago, Milwaukee, St. Paul & Pacific at Milwaukee, Wis., has been promoted to division master mechanic at La Crosse.

ALEC M. MARTINSON, division master mechanic on the Chicago, Milwaukee, St. Paul & Pacific at La Crosse, Wis., has been promoted to district master mechanic at Milwaukee.

R. H. SMITH has been appointed master mechanic on the Nashville, Chattanooga & St. Louis at Bruceton, Tenn.

L. H. MCDANIEL, master mechanic of the Louisville & Nashville at Bruceton, Tenn., retired on December 31.

A. G. GEBHARD, trainmaster on the Illinois Central at McComb, Miss., who has been appointed to the newly created position of master mechanic, Diesel and electrical equipment at Chicago, as announced in the December issue, was born on August 20, 1897, as East St. Louis, Ill. Mr. Gebhard, after attendance at high school, entered railway service on October 5, 1914, as a machinist apprentice with the Terminal Railroad Association at St. Louis, Mo. He then served successively as a machinist in the employ of the Ter-

A. G. Gebhard

minal Railroad at Brooklyn, Ill.; the Pennsylvania; the Illinois Central; the Laclede Steel Company at Madison, Ill.; the Wiggins Ferry Company; the Illinois Central; the National Stock Yards at St. Louis, Mo.; the Laclede Steel Company; the Illinois Central; and the Eagle Pitcher Lead Company. He again returned to the Illinois Central as a machinist and successively became enginehouse foreman; division air brake foreman; general foreman; master mechanic, trainmaster, and master mechanic, Diesel and electrical equipment.

Car Department

W. E. HARMISON, assistant to the superintendent of the car department of the Erie at Cleveland, Ohio, has been appointed superintendent of the car department, with the headquarters at Cleveland.

FRANK H. BECHERER, assistant superintendent of motive power and rolling equipment of the Central of New Jersey at Elizabethport, N. J., has been appointed superintendent of the car department on the Baltimore & Ohio with headquarters at Baltimore, Md.

Shop and Enginehouse

K. E. FOGERTY, general boiler inspector of the Chicago, Burlington & Quincy, Lines East, with headquarters at Chicago, retired on January 1 after 56 years of service.

E. G. STANEIFORTH, boiler foreman of the Denver shop of the Chicago, Burlington & Quincy, has been promoted to general boiler inspector, Lines East, with headquarters at Chicago.

JULES C. BROWN, mechanical foreman of the Cotton Belt Railway at Mt. Pleasant, Texas, retired on December 1, 1941, after 61 years of continuous service with the company. Mr. Brown was the oldest employee in point of service on the entire Cotton Belt System. He is 76 years of age.

Obituary

WILLIAM FREDERICK KUHLKE, superintendent of motive power of the Charleston & Western Carolina, with headquarters at Augusta, Ga., died at his home in that city on December 31.

JOHN E. HORRIGAN, who retired on May 1, 1931, as superintendent of motive power of the Elgin, Joliet & Eastern, with headquarters at Joliet, Ill., died on January 8 at his home in that city. Mr. Horrigan was born at Mendota, Ill., on June 23, 1860. He entered railway service in 1877, as a machinist apprentice on the Iowa Central (now part of the Minneapolis & St. Louis), and later advanced successively to machinist, enginehouse foreman, and master mechanic at Keithsburg, Ill. On May 1, 1893, he went with the Chicago, Rock Island & Pacific as enginehouse foreman at Blue Island, Ill., and the following year became master mechanic on the E. J. & E. at Joliet. Mr. Horrigan was appointed superintendent of motive power at Joliet on May 15, 1899.

PAUL L. MULLEN, assistant superintendent of motive power of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Milwaukee, Wis., died suddenly in that city on January 5. Mr. Mullen was born at Indianola, Iowa, on February 13, 1886, and entered railway service in 1902, as a call boy on the Milwaukee at Perry, Iowa, later serving as a machinist apprentice at Perry and Dubuque. In 1906, he was promoted to machinist at Perry and in 1907, was advanced to assistant enginehouse foreman. From 1909 to 1916, he served as enginehouse foreman at Council Bluffs, Iowa, Ottumwa, Perry and Savanna, Ill., and in the latter year he was promoted to assistant general foreman at Sioux City, Iowa. Mr. Mullen was appointed master mechanic at Austin, Minn., in 1918 and in 1920 was transferred to Savanna.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when it is mentioned.

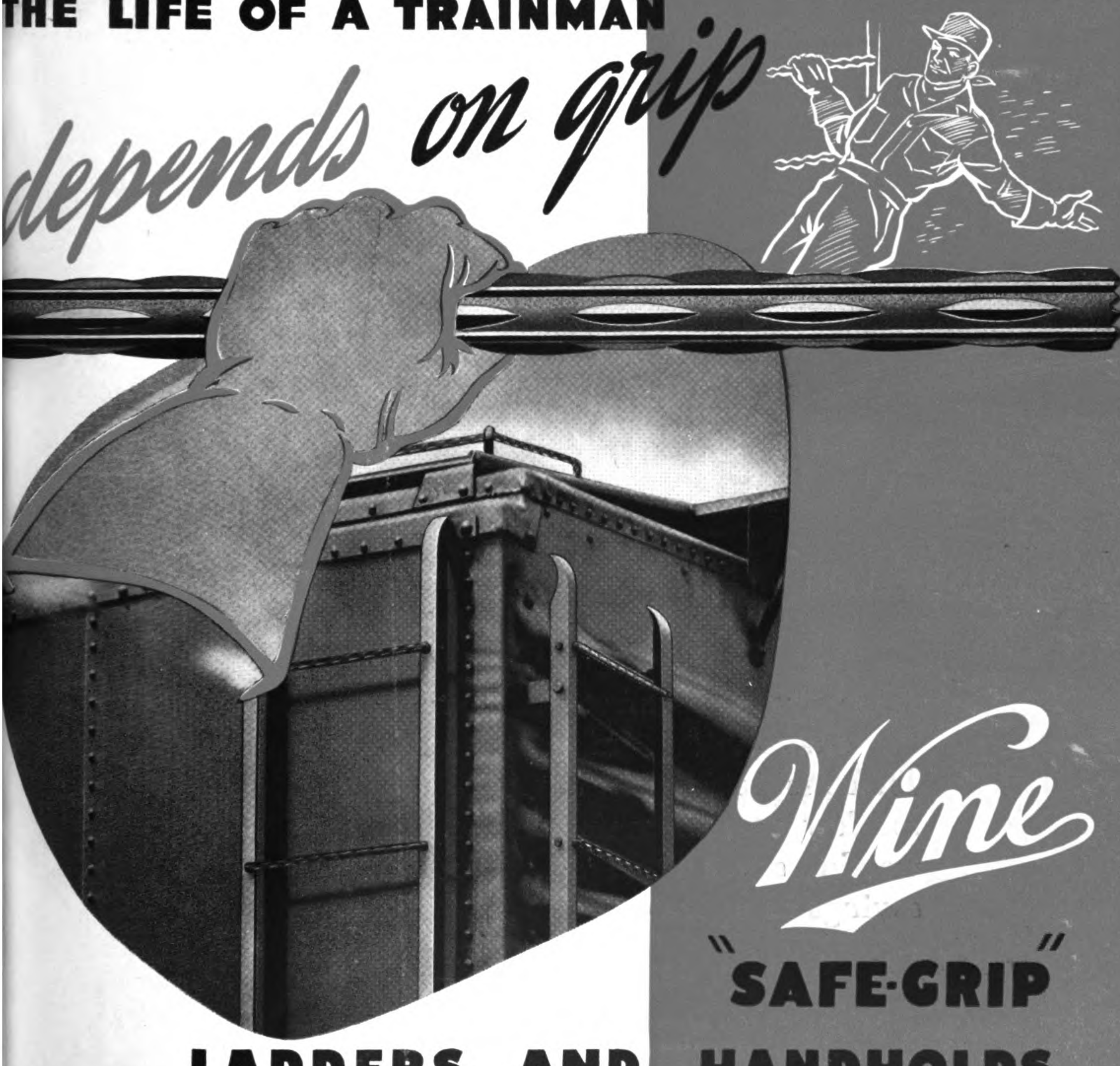
MEEHANITE METAL.—Meehanite Metal Corporation, 311 Ross street, Pittsburgh, Pa. Use business letterhead and give title when requesting copy. Nominal price, $1. 48 pages, spiral bound. A description of the metallurgy and interpretation of the engineering properties of the various types of Meehanite metal and their applications in industry.

HANDBOOK OF SLEEVE BEARINGS.—Federal-Mogul Corporation, Shoemaker and Lillibridge streets, Detroit, Mich. Handbook of eleven sections, by Albert B. Willi, discusses the effect of design, alloys, and manufacturing methods upon sleeve-bearing efficiency and defines the field of application for each basic type of sleeve bearing. Available only to those directly concerned with sleeve-bearing installations.

Railway Mechanical Engineer

March
1942

FOUNDED IN 1832



Published monthly by Simmons-Boardman Publishing Corporation, 1309 Noble Street, Philadelphia, Pa. Entered as second-class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, $3.00 for one year, U. S. and Canada. Single copies 35 cents. Vol. 116, No. 3

RAILWAY MECHANICAL ENGINEER

Founded in 1832 as the American Rail-Road Journal

With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office.

Volume 116 *No. 3*

MARCH, 1942

Published on the second day of each month by

Simmons-Boardman Publishing Corporation

1309 Noble street, Philadelphia, Pa. Editorial and Executive Offices: 30 Church street, New York, and 105 West Adams street, Chicago. Branch offices: Terminal Tower, Cleveland; 1081 National Press bldg., Washington, D. C.; 1038 Henry bldg., Seattle, Wash.; 550 Montgomery street, Room 805-806, San Francisco, Calif.; 530 W. Sixth street, Los Angeles, Calif.

Subscriptions (including, when published, the daily editions of the Railway Age, published in connection with the convention of the Association of American Railroads, Mechanical Division), payable in advance and postage free, United States, U. S. possessions and Canada: 1 year, $3; 2 years, $5. Foreign countries, not including daily editions of the Railway Age: 1 year, $4; 2 years, $7. Single copies, 35 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.), and is indexed by the Industrial Arts Index and also by the Engineering Index Service. PRINTED IN U. S. A.

General:

Car:

Locomotives:

Editorials:

Backshop and Enginehouse:

Car Foremen and Inspectors:

RAILWAY MECHANICAL ENGINEER

A.A.R. Acts To

Conserve Critical Materials

Several committees have presented recommendations for substitutions to replace and measures to conserve and reclaim copper, rubber, tin and steel castings

Various committees of the Association of American Railroads have been studying for some time the possibilities in curtailing the use of critical and scarce materials such as copper, rubber, and tin and the use of substitutes for these materials wherever practicable.

From the A. A. R. Mechanical division, Committee on Brakes and Brake Equipment, a report dated January 9, 1942, covers the results of studies made by that committee in co-operation with the manufacturers of air brake equipment to develop substitutes for brass or bronze and to reduce the amount of copper used in these materials. A special joint committee from the Mechanical and the Purchases and Stores divisions reported under date of January 26, 1942, that the standard specifications for tin and sheet-metal ware have been revised to eliminate the use of tin entirely. The matter of specifications for journal bearings and journal-bearing lining to permit further reduction in the use of tin are under study and a research program has been initiated which is under the direction of the mechanical engineer of the Mechanical division and a committee representing the Committee on Car Construction, Committee on Lubrication of Cars and Locomotives and Committee on Specifications for Materials to develop substitutes for bronze in journal bearing backs and the possibility of further reduction in the use of tin in journal-bearing linings.

The Committee on Car Construction, in a report dated January 29, 1942, on the subject of substitutes for steel castings, advised that, for such important items as couplers, coupler yokes, draft gears and side frames, there is no suitable substitute available for Grade B cast steel. For other parts the committee is recommending substitutions.

A special Joint Committee on Conservation of Rubber, presents its report, dated January 26, 1942, in three exhibits. . Exhibit A lists items made of rubber or containing rubber regarding which no change in existing standard is recommended, for the present. Exhibit B is a list of items made of rubber, or containing rubber regarding which a substitute is recommended. Exhibit C is a list of items made of rubber or containing rubber regarding which a partial substitution may be made but concerning which it is necessary to conduct a further investigation before making definite recommendations.

The various committees of the Association of American Railway are continuing their studies to see if further savings or substitutes can be effected. The manufacturers of specialty devices are co-operating wholeheartedly with the committees in an effort to reduce the strategic and critical materials in their products. The individual railroads are also strongly urged to do everything possible to salvage or reclaim materials of all kinds for further use and in this way reduce the requirements for new materials. This applies to all kinds of materials in addition to the ones covered in the attached reports. It is realized that every expedient must be resorted to in order that there may be sufficient materials of all kinds available for the production of war materials even though, in so doing, the railroads may be required to use materials which may not have the same life expectancy, but which will not impair safety of operation.

Report on Brakes and Brake Equipment

The air brake manufacturers and the Committee on Brakes and Brake Equipment have under consideration the matter of substitution of various other materials for copper, brass or rubber in the construction of air-brake parts. The committee, together with the manufacturers, has carefully considered all of the items in the air-brake equipment which use copper, and submits a list of detail changes which it is felt can be accomplished without impairment of safety of operation.

It is estimated these substitutions will result in saving in brass of approximately 34.7 per cent in the brake equipment studied; or, based on total consumption during the last quarter of 1940, of a saving in copper of about 23.5 per cent for the two air-brake companies.

The manufacturers are continuing studies of other details and will submit recommendations with respect thereto to the brake committee as promptly as possible. Included in these studies will be methods for reclamation of Wabco gaskets. The air-brake companies are changing their patterns and manufacturing methods just as fast as they can to accomplish the changes recommended in the attached list.

Report on Conservation of Tin

The special Joint Committee of the Mechanical and Purchases and Stores divisions, appointed to consider curtailment and conservation of tin, has given careful consideration to the subject and offers the following recommendations:

With respect to A. A. R. standard specifications for tin and sheetmetal ware, it is recommended that all roads adopt these specifications, with substitutions, as follows:

Fig. No.	Item	Present materials	Substitute materials
2	Hand torch, upright type	Sheet steel	No change
2-A	Hand torch, teapot type	Sheet steel	No change
4	Squirt oiler, ½ pt.	Sheet steel	No change
5	Long spout valve oiler, 1 qt.	Sheet steel	No change
8	Tallow pot (valve oil can), 5 pts.	Sheet steel	No change
10	Oil carrier, 1 gal.	Sheet steel	No change
11	Oil carrier, 2 gal.	Sheet steel	No change
13	Oil carrier, 5 gal.	Sheet steel	No change
15	Boiler inspection card case	Tin	Sheet steel
16	Washout card case	Tin	Sheet steel
22	Marking pot	Tin	Sheet steel
25	Funnel, 1 qt.	Tin	Sheet steel, Gran. enamel or glass
26	Funnel, 1 gal.	Tin	Sheet steel, Gran. enamel or glass
28	Measure, 1 qt.	Tin	Sheet steel, Gran. enamel or glass
30	Measure, 1 gal.	Tin	Sheet steel, Gran. enamel or glass
31	Journal oil can, 2 gal.	Sheet steel	No change
34	Coal hod	Galv. iron	Sheet steel
36	Pail, 12 quart	Galv. iron	Gran. enamel
37	Fire pail	Galv. iron	Fibre
38	Soil can	Galv. iron	Sheet steel
38-A	Soil can	Galv. iron	Sheet steel
40	Refuse and garbage can	Galv. iron	Sheet steel

With respect to the following additional general tinware, and all other similar items formerly tinned, the Committee recommends material be used as below:

Item	Material
Oil containers and utensils	Sheet steel
Flagman's cases	Sheet steel
Drinking water field cans	Wood or fibre
Paint cans, all kinds	Sheet steel
Drinking cups	White or gran. enamel
Oil founts	Sheet steel
Hand lantern frames	Steel (paint or enamel)
Drinking-water cans	Granite enamel

It is recommended that terne plate or sheet steel be used in place of tinplate.

Check shops, enginehouses, yard buildings and supply boxes periodically for excess tinware not required for current needs and return to store stock.

The Specifications for Tin and Sheetmetal Ware should be revised in accordance with the above recommendations and the word "Tin" eliminated throughout.

Since solder is a large item in which tin is used, it is recommended that wherever possible other forms of connections be used—brazed, welded or "solderless."

Spec. M-501-38, covering lined journal bearings, last revised in 1938, for composition of lining, shows the percentage of tin to be used "as specified." It is found that many railroads are specifying tin in excess of 3 per cent, and many times considerably higher than this percentage. In order to conserve the use of tin it is recommended that the following composition of journal bearing lining be used for the present emergency:

4. Composition of Lining—

	Per Cent
Tin	1.0 to 3.0
Antimony, not less than	8.0
Tin and antimony	9.0 to 14.0
Arsenic, maximum	0.2
Copper, maximum	0.5
Sum of tin, antimony lead and arsenic, minimum	99.25
Remainder, maximum	0.75

It is the feeling of the Committee on Specifications for Materials that this will work no hardship and will not cause any particular trouble. As a matter of fact, some railroads are not specifying any tin for journal bearing linings depending on the residual tin contained in the melt of used linings, which usually produces a bearing lining having tin composition from 1 per cent to not over 3 per cent.

By following the recommended specification shown above it is felt that very little, if any, new tin will be required to be added to journal bearing lining composition for the duration of the present emergency.

Substitutes for Steel Castings

The subject of substitutes for steel castings for new equipment as well as maintaining existing equipment has been thoroughly canvassed and it is the consensus of opinion of the Committee on Car Construction that, for such important items as couplers, coupler yokes, draft gears and cast-steel side frames there is no suitable substitute available for Grade B cast steel.

The committee, as a whole, favors the present designs of cast-steel bolsters, but, in the event it is impossible to obtain bolsters in cast steel, it is recommended that consideration be given to substitutes such as built-up and welded bolsters. Several such bolsters are in existence including the built-up welded bolster of the Carnegie-Illinois Steel Company which has passed static tests and been approved for interchange service. Another type of built-up bolster has been developed by the Pullman-Standard Car Manufacturing Company, that company's drawing 518-D-20 for 50-ton capacity trucks. That company has also agreed to prepare designs for this type of bolster for 40- and 70-ton trucks.

During the present emergency it will probably be necessary to reduce the physical requirements now specified for cast steel bolsters and it is the opinion of the committee that this will be satisfactory during this War period. The matter of what reduction will be permitted is being considered by the special subcommittee on bolsters and side frames and report will be made later.

Suggestion is also made that the pressed steel bolster formerly included in the Manual of Standard and Recommended Practice be considered by this Subcommittee in connection with this matter.

In reference to miscellaneous small castings it is believed that malleable iron can be substituted for cast steel. A report on this subject was included in the 1935 report of the Committee on Car Construction.

We have, therefore, carefully reviewed this subject and the following list of parts is submitted:

Freight-Car Equipment Items for Which Malleable Iron Is Considered a Satisfactory Substitute for Cast Steel

Brake-badge plate	Front follower blocks used with horizontal yoke attachments
Brake-beam strut	Hand-brake wheel, pawl, pawl plate and ratchet wheel
Brake head	Journal-box lid
Body-side-bearing brace	Push pole pocket
Coupler carrier	Truck-side-bearing housing, anti-friction type
Corner cap, end and side plate connection	Uncoupling-lever brackets
Draft-gear cheek plates	
Draft-gear carrier	

Note.—This list is not intended to include all proprietary details which may be offered in malleable iron.

Attention is also called to the fact that drop-forged body and truck center plates have come into quite general use instead of cast-steel center plates and are preferable to malleable-iron center plates, also that built-up forged center fillers and draft lugs are in quite general use and are also preferable to malleable iron. The members are all urged to substitute other materials for cast steel except for couplers, yokes, draft gears and side frames wherever practicable.

Report on Conservation of Rubber

The special Joint Committee of the Mechanical and Purchases and Stores Divisions, Operations and Maintenance Department, Association of American Railroads, appointed to consider curtailment and conservation of rubber, has given careful consideration to the subject and offers the following recommendations:

Exhibit A—List of items made of rubber or containing rubber regarding which no change be made at present from existing standards. As materials are developed it may be possible to transfer some of these items to Exhibits B or C.

In compiling this list of items the Committee was guided by the importance of safety of operation and pre-

(*Continued on page 106*)

Karl Fritjof Nystrom, D. Eng.

Builder of the Hiawatha—Leader of men—Refuses to run in a rut

When Marquette University, on June 11, 1941, conferred the degree of Doctor of Engineering, *honoris causa,* upon K. F. Nystrom, mechanical assistant to the chief operating officer of the Chicago, Milwaukee, St. Paul & Pacific, the citation included these words: "With over forty patents to his credit which have brought him outstanding, national recognition as an engineer, who is responsible for much of the development in the field of light-weight cars for railroad transportation, and has been a pioneer in the advancement of safety and comfort in modern rail transportation, and who, in particular, by his unique combination of vision, technical ability and executive leadership, has exemplified to an unusual degree the highest ideals and the finest traditions of the engineering profession."

Here is a man, born and brought up abroad, who could not even speak the English language when he came to this country at the age of 24. Today his ability as an engineer and as a railway mechanical department executive is widely recognized, and Marquette University has placed its stamp of approval upon him. What qualities does he possess that made this possible? By what path did he arrive at his present position of eminence?

Born and Educated in Sweden

First let us sketch in, in rather broad outlines and with reasonable detail, the important steps in his career.

This is the last of three more or less intimate stories about railway mechanical department officers who last June were honored with Doctor's degrees by American colleges and universities. They answer quite conclusively the question as to why it was that these men were so honored. A biographical sketch of George McCormack, general superintendent motive power of the Southern Pacific Company, appeared in our January number; a similar story about Frederick W. Hankins assistant vice-president of the Pennsylvania Railroad was published in the February issue.

Mr. Nystrom was born in September, 1881, in Aspa Bruk, Sweden, apparently a small iron works, for you will not find it on the ordinary map. He was thrown largely on his own resources at the age of 14, working during his school vacations and living on an extremely modest scale. He was graduated from the Mining School at Filipstad, Sweden, in 1904, as a mechanical engineer. During his college career he spent summer vacations working in machine shops in Stockholm and steel mills in other parts of the country.

There is no question about his working hard at college, for he graduated at the top of his class and was awarded a prize of 500 kroner. Nor is there any question about the fact that in order to finance his college education he had to endure hardships that would be classed as most unusual in this country. Incidentally, students in engineering colleges in Sweden are well grounded in the fundamentals of engineering. Text books were (and probably still are) expensive and rather scarce, as compared to this country. The lecture system was therefore resorted to more extensively. Possibly this accounts for a more thorough basic engineering training, in some respects at least, as compared to places where text books are more plentiful, and therefore not so highly regarded.

Came to This Country at 24

After graduation he went to Germany to study high tensile steel, but soon decided to follow up his studies in this country. He arrived in 1905, with practically no knowledge of the English language, and was immediately attracted to Pittsburgh, the center of the steel industry.

Mastering the English language and getting started in industry was no easy task. He worked as a blueprint boy and then as an engineer, for the Midland Steel Company, and then took a job with the American Steel & Wire Company, still at a bare subsistence wage. Overwork made him an easy target in a typhoid epidemic and for months he was confined to a general ward of the Pittsburgh Hospital. Recovering, he became a draftsman for the Pressed Steel Car Company, but in 1909 was engaged for a few months as a member of the engineering staff of the Pullman Company. He then went with the Southern Pacific during the electrification of its Oakland—Alameda interurban line and designed and supervised the construction of the first electric interurban cars for that service. Following this, in 1911, he was made assistant mechanical engineer of the American Car & Foundry Company. He was mechanical engineer of the Acme Supply Company in 1912-13 and by that time was well launched on his career.

Karl F. Nystrom

Becomes a Real Railroader

In 1913 he became chief draftsman of the car department of the Grand Trunk, now the Canadian National. He accepted a similar position with the Canadian Pacific in 1918, but in 1920 returned to the Grand Trunk as engineer of car construction.

In 1922 he was appointed engineer of car design, Chicago, Milwaukee, St. Paul & Pacific. He has remained with that road, being promoted to engineer of motive power and rolling stock in 1925; functioning as master car builder from July to September, 1927; and then becoming superintendent of the car department. In 1937 he was promoted to his present position of mechanical assistant to the chief operating officer with general supervision of the car department, and in addition supervision of engineering, designing, construction and co-ordination of facilities in the mechanical department. On September 1, 1941, his jurisdiction was extended to include all branches of the mechanical department.

Builder of the Hiawatha

The early part of Mr. Nystrom's career, and until he became a master car builder 14 years ago, was almost entirely in the field of freight and passenger car design. When he became an executive in the car department his active and ingenious mind continued to be intrigued by the problems involved in still further improving the design, construction and operation of such equipment. Nothing has been too revolutionary for his consideration; nor has he allowed his vision or thinking to be hampered by conforming to ordinary practices or by running in a rut.

Mr. Nystrom astonished the railroad world when in 1934 he designed and started to build in the railroad's shops at Milwaukee all-welded steel coaches,[1] which were a distinct departure from ordinary car building practices and provided comforts and even luxuries not ordinarily available on coach equipment at that time. By welding the structure,[2] rather than riveting it, and through other devices, the weight of the cars was reduced from 31 to 33 per cent, thus effecting substantial economies in operating costs, as well as facilitating the maintenance of higher train speeds.

Not many months after the first of these cars was constructed the streamlined, high-speed steam locomotives built by the American Locomotive Company made it possible on May 29, 1935, to place the famous Hiawatha trains in regular service between Chicago and the Twin Cities.

Not only did the railroad design the cars, but the entire technique of building them had to be developed, in order successfully to manufacture them in its shops. Mr. Nystrom, for instance, called on all the available talent in the field of electrical welding. There were wide disagreements among the experts, however, and in the last analysis it was necessary to go forward boldly and largely on his own initiative to develop the facilities for the successful fabrication of this equipment. More than this, it was necessary to assemble and train a considerable force of welders. As is always true in pioneering into new fields, errors were made, but this only challenged a greater ingenuity and a larger effort on the part of Mr. Nystrom and his staff.

From that day to this, steady improvement has been made not alone in the processes of building the equipment, but in its design and construction as well. One of the first steps in the further improvement program of the Hiawatha equipment was the use in the second, or 1936 design[3] of light-weight, high-tensile steel, and the introduction of other light-weight materials. This made possible a further saving of 10 per cent in the weight of the new cars, over the first all-welded ones; they were thus more than 40 per cent lighter than the conventional steel passenger cars.

While on the third, or 1938 Hiawatha design[4] few changes were made in the details of construction, many improvements were introduced to insure greater ease and comfort to the passengers.

Just as remarkable as the improvement in the design of the body of the cars has been the steady and continued development of the trucks; here, too, the beaten track has been departed from and new and novel features have been introduced, which have greatly improved the riding qualities at the high speeds at which this equipment is operated. From the very first the Hiawathas have been notable because of their easy riding qualities, but today they stand unexcelled in this respect.

Mr. Nystrom's thoroughness and scientific approach to such problems are well illustrated by the experimental procedure followed in developing and improving passenger car trucks. Instruments were placed in different parts of the car to record the vertical oscillations, as well as the lateral movements. Other instruments giving similar information were placed on the truck. One of the platform steps was removed and a well installed in its place, with a window facing the truck; through it all movements of the truck could be observed. Motion pictures were also taken through this window while the train was running at various speeds and in different localities. Similar pictures were taken after each change of design. A comparison of these pictures projected upon a screen made it possible to check critically and in detail the effect of the changes or modifications. As one of Mr. Nystrom's associates remarked: "Needless to say he was present at all these trials."

The Lowly Box Car

The lowly box car does not rate so highly in the public eye as does passenger equipment, and yet the improvement of freight car design on the Milwaukee, under Mr. Nystrom's direction, has been quite as radical, though less spectacular, as the change from the standard coach equipment to the modern light-weight, streamlined designs. The latest development in this respect was the completion of the 500 fifty-ton, all-welded box cars[5] constructed of high tensile steels, at the Milwaukee, Wis., shops; these embody a number of unusual features. With a light weight of 48,200 lb., the cars have a capacity of 5,157 cu. ft.

These radical innovations in the passenger and freight equipment are typical of the approach which has been made under Mr. Nystrom's guidance to all phases of mechanical department operations and activities. Certain important considerations should not be overlooked, however. "In the face of many new and radical changes," reports one of his technical associates, "he has always insisted that the design must be practical, and above everything else, safe. He is a master of detail, and follows a project through to conclusion, from the time it appears on the drawing board to the finished article. In addition, he follows each move in the fabrication, suggesting ideas for the many dies and jigs, and the routine progress of each operation through the shop. He often comes back to the shop when most of us are asleep. He is full of ideas, but will graciously withdraw any if it can be proven to him they are not entirely safe."

---

[1] *Railway Mechanical Engineer*, October, 1934, page 361.
[2] *Railway Mechanical Engineer*, December, 1934, page 444.
[3] *Railway Mechanical Engineer*, November, 1936, page 467.
[4] *Railway Mechanical Engineer*, March, 1939, page 95.
[5] *Railway Mechanical Engineer*, December, 1941, page 508.

Car Department staff meeting, May 20, 1932

Related Activities

As already noted, the greater part of Mr. Nystrom's career, until more recent years, has been concerned with the car department. Naturally he has taken an active part in railroad associations interested in its activities, and car department officers have been appreciative of his assistance and co-operation in that respect. One evidence of this was the presentation to him in November, 1938, by the Car Department Association of St. Louis, of a bronze plaque containing this inscription: "For his outstanding contribution to the science and art of design and maintenance of railway rolling stock."

In 1930 Mr. Nystrom was elected president of what was then known as the Master Car Builders' and Supervisors' Association. Hard hit by the depression, it was forced to lie dormant for seven long years. Its president, however, was not unmindful of his responsibilities. He was constantly on the alert to take advantage of any opportunity to restore the association. When it held its next meeting in the fall of 1937 it was naturally smaller in size, but it had a new constitution to provide for the changed conditions, and adopted a new name—the Car Department Officers' Association—which was much more expressive of its real status. When Mr. Nystrom laid down his office at the convention in 1938 the association was in a most thriving condition.

He has not always seen eye-to-eye with committees of the Association of American Railroads. He was a member of its car construction committee for several years, and his novel and original ideas stirred up lively discussions. His road is now represented on that committee by his engineer of car construction. While sometimes at variance with A. A. R. committees he has always been generous in supplying them with information, or in assisting them in other ways.

He has been a member of the American Society of Mechanical Engineers since 1921, taking an active part in the Railroad Division of the Society; recently he was chosen a member of the executive committee of that Division.

Interested in Engineering Education

Mr. Nystrom has a keen appreciation of the importance of education and training on the job. He is also, however, greatly interested in more formal education, particularly in the field of engineering. Marquette, a Catholic university, is located at Milwaukee, which also is the home of the great shops of the C. M. St. P. & P. The university has a small, but excellent, engineering college, which is conducted on the co-operative plan, i.e., the students spend part of their time in industry while attending college, and the theoretical training and practical experience are co-ordinated. The student thus has a keener appreciation of the importance of his college work, and when graduated has a sufficient experience in industrial practices to get him off to a good running start in his profession.

Mr. Nystrom is not a Catholic and his broad-mindedness is indicated by the fine way in which he has co-operated as a member of the Board of Supervisors of the College of Engineering of that institution. His active assistance has extended not alone to the forwarding of the co-operative feature of the engineering training, but into all phases of its program, and notably into the planning and arranging of more adequate physical facilities. The awarding of his degree coincided, in fact, with the opening of the new engineering building.

Mr. Nystrom is a believer in small engineering colleges; the student body in that college of Marquette University is in the neighborhood of 500. While he places strong emphasis upon thorough training in fundamentals, he is not unmindful of the importance to an engineer of a broader cultural training and an appreciation of good citizenship.

As An Executive

Mr. Nystrom's career and achievements, as they have been thus far presented, have had little if any reference to those things that set him apart, not as an inventor or designer and builder of equipment, but as a successful executive and leader of men.

When he was appointed to the position of superintendent of the car department, it was predicted by some that he would make a mess of things. It was pointed out that he was a highly technical man and that he would be unable to deal successfully with car foremen and car inspectors who are practical men interested in maintenance and do not have an engineering background. His critics overlooked the fact that a technically trained man in such a position, with a "sprinkling of horse sense" should, in general, do a better job than the man without an engineering training.

He went at the broader task in a most sensible and direct way. His work as a successful designer had naturally brought him in contact with car maintenance problems. He recognized his lack of experience in doing strictly maintenance work, however, and started to meet frequently and regularly with the car foremen—a practice he has never discontinued. The foremen were encouraged to make suggestions for more efficient and more economical operation. Keenly observant, ingenious and open-minded, Mr. Nystrom saw ways in which he believed current methods and practices could be im-

proved. He discussed these freely and frankly at the meetings. No changes were made unless the group so voted. If objections were offered to the suggestions, he took them under further advisement and brought them up at later meetings; sometimes modified plans were eventually adopted.

It all resulted, however, in making the foreman more alert and more expert, and it developed methods and practices which have made possible more economic and effective maintenance. As a result of this procedure, for instance, all passenger car repairs are now concentrated at the Milwaukee shops rather than being done at seven points on the railroad. Heavy repairs to freight cars, formerly done at eleven points, are now concentrated at four points.

Teacher — and Leader

One who is close to him and his organization, and sees him "with his hair down," so to speak, characterizes Mr. Nystrom as a "master of organization, who does not drive but leads." This is well illustrated by the infinite pains he takes to "sell" ideas to his subordinates. He realizes that if men are to do their best work, they must put their whole heart into it—that they must be enthusiastic! He will not tolerate "yes" men. Obviously that means that his associates must be fully and intelligently informed. He has always been handy with his sketch pad, and with a few colored pencils, which he keeps handy, he has the faculty of visualizing his ideas in a clear and striking manner.

But those who are closest to him have noticed also an interesting tendency in more recent years. To drive home his points, and to dramatize their meaning, he has resorted more and more to the utilization of strategy adopted by master teachers—to speak in parables; simple ones if you will (the simpler the better), and frequently to season them with humor. Obviously such a man must be endowed with a patient and charitable disposition, and so he is.

On the other hand, once having made up his mind he drives forward with full vigor and a remarkable persistence. There is no such a word as "no" in his vocabulary, once the die is cast. And because his associates recognize this they play the game with a zest, and by ingenuity and strategy overcome what might otherwise seem to be insurmountable obstacles. They realize this also—the boss will never let them down, or out in the cold. They may make mistakes or errors of judgment, but if they have done their best they can rest assured that he will stand back of them. There is no carping criticism, but rather a broad tolerance which does not overlook mistakes but rather tries to capitalize upon them. When a mistake is made, the question is not so much "What has it cost us?" but "What can we do to take advantage of it and capitalize upon it?"

His Labor Policies

From what has already been said, it must be apparent that Mr. Nystrom's department is not hampered by labor difficulties. He has done everything he could to stabilize employment, and the men and their leaders understand and appreciate this. He has shown a keen interest in the welfare of the employees, collectively and individually, and has attacked the safety problem not in the spirit of "accidents must be stopped," but rather in an intelligent and almost prayerful attitude in the effort to secure the co-operation of every employee in eliminating sources of accident.

In speaking of his men he is quite likely to refer to them as "My Boys." This is not in a paternalistic attitude, however, but rather in the spirit of one who is proud to be associated with his co-workers.

Possibly the observations of a labor representative may give a more intimate picture of Mr. Nystrom's handling

Mr. Nystrom (second from left) worked in a small mill in Sweden during one of his college vacations—Genuine Swedish wrought iron was fabricated—Because of extreme heat in the mill, the clothing consisted of nothing but a long shirt made of rather heavy canvas duck, woolen socks, and homemade wooden shoes

of labor relations. "The nature of the propositions I have to take up with him," says this representative, "as you may well know, are not always such that he can give his full approval, but his keen understanding of the employees' problems makes for his sympathetic consideration, and his decisions once given are always carried out. Two of his outstanding characteristics are sincerity and integrity, and such being the case the representatives of labor, who deal with him, and the employees in the shops have confidence in him. He is accessible at all times when an appointment has been made, and his conversation and discussion is easy, refined and sincere, never boisterous and at no time does he stoop to vulgarity.

Commencement Day at Marquette—Left to right: Karl F. Nystrom, Doctor of Engineering; Dr. Rock Sleyster, Doctor of Laws; John G. Gregory, distinctive civic service award; Rev. Raphael C. McCarthy, S. J., university president; Capt. William F. Amsden, U. S. N., naval reserve director of the Ninth Naval District

"It has been a source of great satisfaction and pride to the labor representatives who have dealt with him these many years, that every situation that has arisen and needed adjudication has been disposed of without a single dispute ever having been submitted to the Railroad Adjustment Board for a decision."

Digging still further into the background, we find that Mr. Nystrom has taken great pains to keep the representatives of labor fully informed as to the problems with which the railroads, his railroad, and his particular department are confronted. He has talked these matters over with them frankly and has supplied them with accurate and ample facts and figures.

A striking instance of a direct appeal to the workers was that made in 1934 when the first welded steel passenger cars were being built. It was quite generally conceded that the railroad company's shops were not organized or equipped to undertake such a program. Difficulties were encountered from the outstart and it looked as if the time schedule could not be met and that the expenses could not be controlled and kept within the estimates, on the basis of which it had been decided to do the work in the company shops. A mass meeting was called of all the men in the shop. Mr. Nystrom explained the situation to them and appealed to them for support. As a result the cars were delivered exactly on the date promised and enough money was saved to purchase the first two Hiawatha locomotives and air-condition 30 passenger cars.

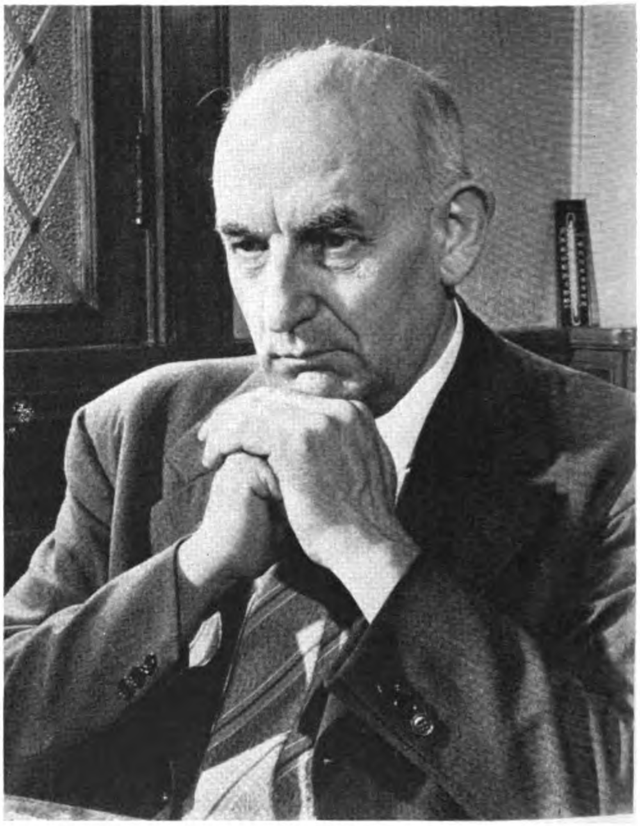
One of the general chairman makes this additional comment: "He has no favorites among his supervisors and merit and fitness are qualifications for promotion and assignments." He might have added, if it had occurred to him, that Mr. Nystrom has never gone outside the organization for supervisors; he finds them on the inside. The inference is, of course, that he trains and develops them.

Intimate Side Lights

A psychologist must surely be intrigued by Mr. Nystrom's personality. Gustave Pabst, Jr., financial editor of the Milwaukee Journal, pointed out that he had "built his ladder of life on three ideas"—self-reliance, never look at a clock, and work twice as hard as the other fellow. His close associates comment on his courage, his persistence, the fact that he looks to the future, decides on his goal or objective, and then strives unceasingly to attain it.

Contrast this then with the other side of his nature. He is "modest and self-effacing," says an intimate; "kindly and charitable," says another. It is pointed out that "one quality of his which has impressed me is the unassuming attitude which characterizes him. He has the humility that is found in really great men." Or, says another, "in times of grief or trouble he is found to be the first to aid those under him."

Do we find here a rare combination that helps to make for leadership? An associate who has worked at his elbow for two decades sums up his personality in these words: "He has the knack of getting what he wants done without in any way being a driver."



Thinking a problem through

He is keenly interested in people, and especially in the younger ones. He does not talk about it but his intimate associates know what he has done, sometimes without being known in the transactions, to assist in the

(*Continued on page 105*)

Great Northern Cabooses

Heavy wood superstructure is built on reclaimed steel underframe — Sharp corners and projections carefully avoided on the interior

In order to meet adequately exacting service requirements in connection with fast, heavy, long-haul freight train operation, the Great Northern has built at the company shops, St. Cloud, Minn., a lot of 20 cabooses. These are of unusual interest as they include many special features developed to assure increased safety, comfort, and convenience for train crews. They operate through from Twin Cities to Puget Sound terminals, thus eliminating loss of time incidental to frequent caboose changes en route. The number of caboose cars required to cover these runs is also reduced.

The trucks are Bettendorf caboose-type with one-wear wrought-steel wheels, journals 4¼ in. by 8 in., No. 15 brake beams with Creco third-point supports, Miner roller side bearings, etc. The underframe is of exceptionally rugged construction designed to afford adequate protection in the heaviest pusher service and at the same time permit the utilization of second-hand materials, thus reducing the drain on structurals needed for other purposes and effecting a considerable saving in cost.

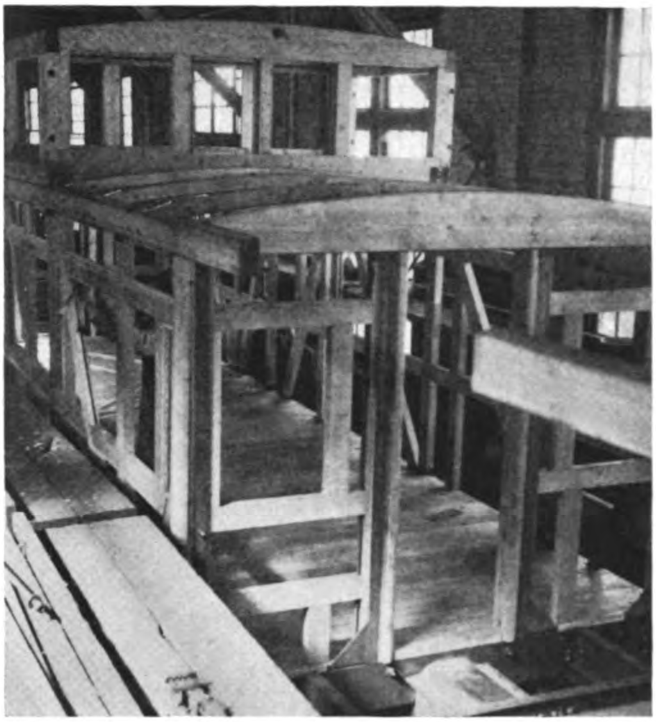
There were available "basket-type" steel underframes recovered from retired 40-ft. 40-ton box cars, consisting mainly of a pair of 10-in. 35-lb. channels with full ⅜-in. top cover plate, cast-steel body bolsters, metal crossties and end sills, A.A.R. friction draft gears and 6-in. by 8-in. couplers. These underframes, being only 10 years old, evidenced little if any corrosion, and the steel was practically the equivalent of new material.

Much ingenuity was used in adapting this underframe to cabooses. In order to give the extra distance from end to body bolster to accommodate steps and platforms, the rivets securing the bolsters to the center sills were removed; the bolsters were jacked back 18¾ in. and reriveted in the new position. Since the center sills were about 4 ft. too long a section was cut away near the center. Two additional 10-in. 35-lb. channels, long enough to reach from back stop to back stop, were placed between and back-to-back to the center sills. The original sills were then weld-spliced and the entire assembly riveted together; the ends of the auxiliary channels were welded to the rear back stops to eliminate any possible hinge action at that point. A ½-in arched auxiliary top cover plate, extending from the platform to back of the draft stops, was applied to protect against any possible buckling in that region. The original channel end sills, strikers, draft stops, etc., were not disturbed. Side sills and body end sills are 10-in. channels. The entire underframe assembly was secured by welding and riveting, thus making an underframe structure much stronger than that of a modern box car and giving increased protection to train crews.

Special friction draft gears, having a high capacity ultimate but possessing a soft action through the first half travel, were selected as being best suited for cabooses. Couplers are 6¼-in. by 8-in. Type-E, bottom-lift, with A. A. R. cast-steel yokes. Brake equipment is K2, with a Universal horizontal-wheel power hand brake at each end of each car. Combined conductor's valve and back-up whistles are mounted on platform railings near the hand brakes; an air gage and a conductor's valve are installed in the cupola. A bleed cut-out cock is placed just back of the angle cock as a safety measure when a pusher locomotive is cut off.

Reinforced Wood Construction in the Superstructure

The superstructure is of heavy wood construction substantially reinforced with steel. Corner and end posts are made particularly strong as a protection against possible telescoping. Malleable pockets were used on side posts and braces. Roof framing is of Z-bar construction. Cupola framing is built into the body framing in such a manner as to preclude weave between the two. The floor construction consists of a $^{25}/_{32}$-in. T. & G. subfloor, covered underneath with second-hand galvanized iron as a protection against weather and sparks. On the subfloor is placed a layer of waterproof paper, 2 in. of Stonefelt and another layer of waterproof paper. An air space is allowed and the 1¾-in. T. & G. main floor laid. This is covered with another layer of waterproof paper and



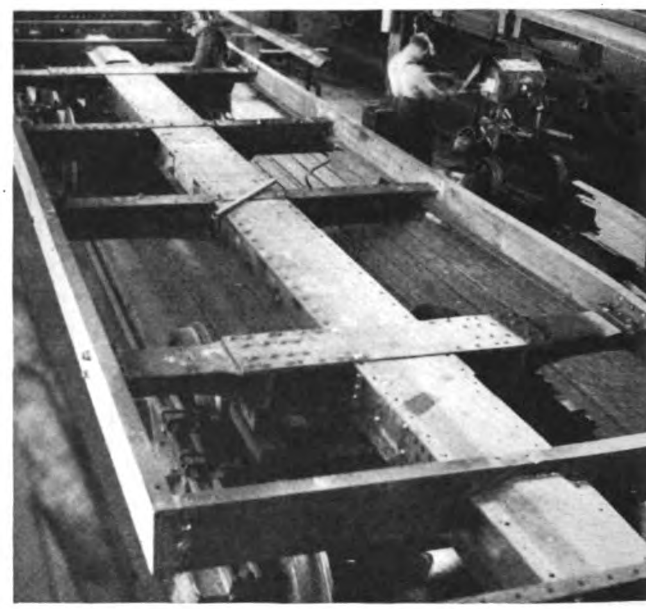
The wood superstructure frame, reinforced with steel at corner and end posts

the finish floor, of 25/32-in. by 3¼-in. lumber, applied.

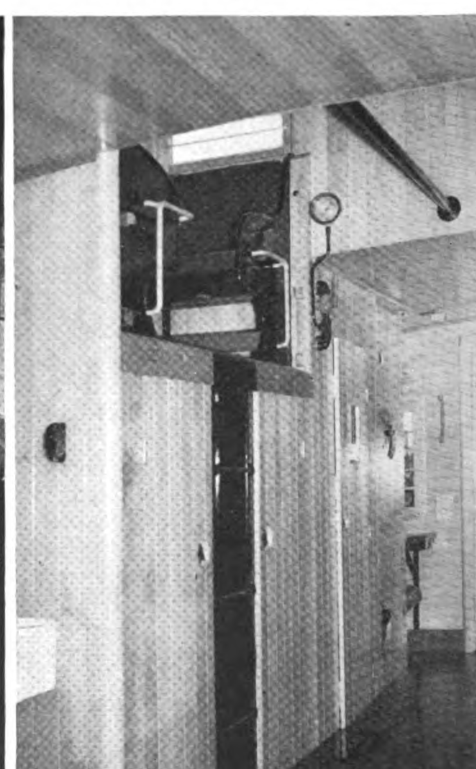
The roof construction consists of special 25/32-in. by 3¼-in. ceiling, waterproof paper, 2 in. of Stonefelt, another layer of paper, an air space, 25/32-in. roof boards, covered with Mulehide canvas roofing and coated with Texas car cement. The side and end walls consist of 25/32-in. by 3¼-in. sheathing, waterproof paper, ¾-in. Insulite board, air space, ¾-in. Insulite board, another air space, waterproof paper and special 25/32-in. inside finish. This extra insulation was considered desirable in view of severe climatic conditions, both winter and summer, to which these cars are subjected.

The caboose steps are metal and the treads, as well as platform floors, are of open-work spot-welded steel. The outer edge of treads is tubular and the lower tread is in line with the outside of the body sheathing and 16 in. above the top of the rail. The platform end sill extends 2 in. above the floor; the platform railing consists of 1¼-in. pipe, bent to shape and securely fastened to the platform end sill channel. Instead of the chain ordinarily used across the platform opening, a gate, of bent pipe, is installed. The railing is above the height in general use, and the platform is further protected by splash

(*Continued on page 105*)



The steel underframe as substantially strengthened and rebuilt for caboose car service



Left: The stove and other equipment installed at one end of the car—Right: At the cupola corners are rounded and projections recessed

M. B. M. A. Report on

Application of Rivets*

THE use of large boilers and the consequent increase in total evaporation has aggravated troubles occasioned by encrustation and expedited the adoption of means for improving boiler water conditions which, in certain sections of the country, has been followed by "inter-crystalline corrosion," a term descriptive of the condition which develops in steel when subjected to high stresses in the presence of sodium hydroxide. The fact that these stresses are influenced by any factor producing a load on the rivets has led to a study of means for reducing rivet stresses regardless of the manner in which such stresses are produced; that is, whether directly by the normal stresses in the joint resulting from pressure or indirectly by stresses introduced in the rivets by driving at excessively high pressure or otherwise. This, in turn, led to consideration of all of the factors tending to increase the load on rivets beyond that produced by steam pressures and boiler design. It was not until much study had been given to the matter of intercrystalline

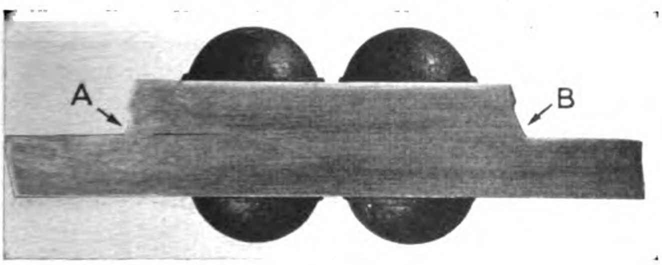


Fig. 1

corrosion that the possibility of introducing conditions favorable to this development through excessive rivet driving pressures became a subject of importance in boiler fabrication.

The studies to which reference is made have led to definite conclusions which may be grouped under the following headings, under which appear corresponding discussions:

Assembling of Plates

Stresses upon rivets in horizontal seams may be greatly minimized through the proper preparation of the seams through which the rivets are finally driven. This requires that the longitudinal courses be so formed that the sections of the plates which are to be joined shall have the same radius as that to which the course itself is to be made. This requires either that the adjoining edges shall be pressed to the proper radius or that the course be rolled and the flat portions of the adjoining plates discarded. Either of these procedures, if properly performed, will produce the desired results, although it is obvious that the use of the pressed edges will involve the least expense. The outside and inside welt straps should likewise be accurately formed in dies having the proper radii.

The subject of boiler fabrication has been covered in a report (Topic No. 5—Application of Iron, Steel and Alloy Rivets) made to the association in 1940. The following revisions and additions, however, are suggested in order more completely to insure accuracy in the preparation of the plates for rivet application; to insure that the plates are drawn metal to metal and that the rivets are not over stressed but are tight enough to avoid seepage through the rivets and joints. This is necessary in order to avoid the intercrystalline corrosion of the metal in both the rivets and the plates. In lieu of the paragraph (fourth paragraph, page 74, 1940 Proceedings) relating to the application of temporary bolts in the circumferential and horizontal seams, substitute the following:

Assemble shell courses by heating one course at the girth seam and then entering the unheated courses into the heated one. It is suggested that the allowable shrinkage be established at a maximum of 3/16 in. and a minimum of 1/8 in., measured on the

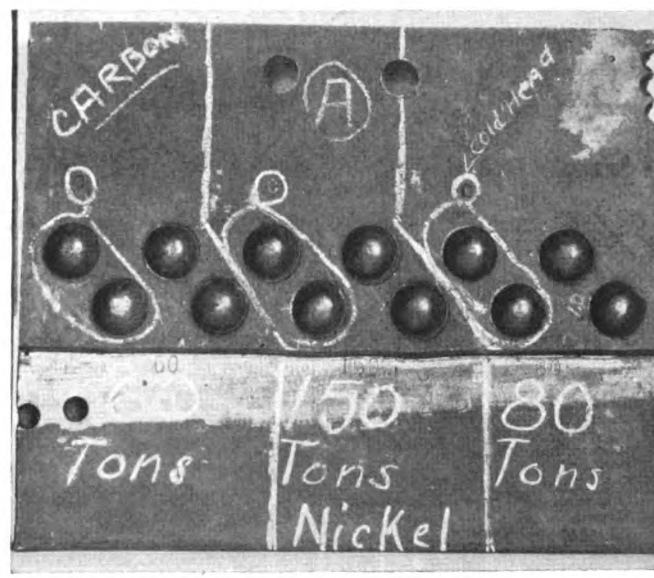


Fig. 2

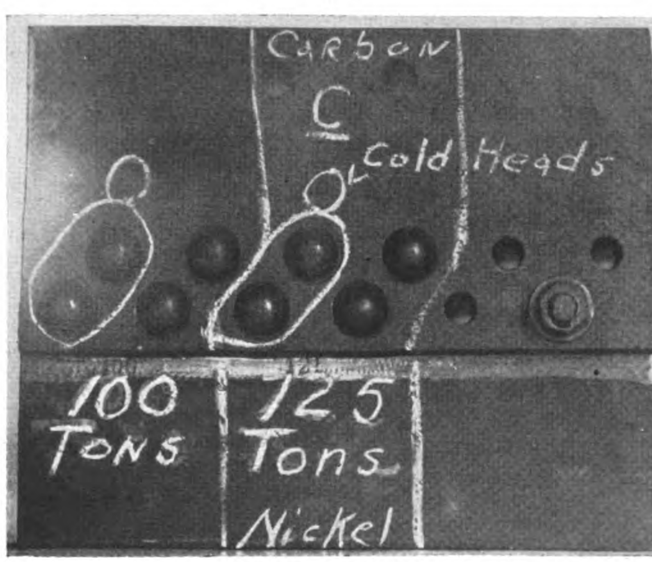


Fig. 3

* Abstract of a report presented at the annual meeting of the Master Boiler Makers Association, Chicago, September 23 and 24, 1941.

outer circumference of the course which is to be telescoped. Care should be exercised in the assembly to avoid the setting up of stresses.

Boiler-shell courses are required to be bolted together first at quarter, then at eighth, and so on in sequence of holes opposite one another, and when riveting the same procedure should be followed. In this procedure the temporary bolts should be placed in every other hole.

It is also suggested that the following requirements be added to the portion of the 1940 report covering fabrication which relates to longitudinal seams:

Longitudinal shell-course seams which are designed with inside and outside welt straps, multiple riveted, shall have the welt straps and rivets caulked inside and outside. Inner welt straps of longitudinal shell-course seams shall be scalloped to facilitate caulking.

Flanging of tapered courses on a bull machine to make them fit other courses, or drawing up plates on the bull machine will not be permitted.

Eccentricity of the shell courses should be kept to a minimum and, when finally assembled and riveted, they should not exceed ¼ in.

In its 1940 report on Topic No. 5, the committee illustrated certain tools suggested for caulking operations, which included a fuller caulking tool as well as a combined square and fuller type. Experiments made under the supervision of the secretary-treasurer indicate that the influence of the fuller type of tool may cause a separation of the plates back of the caulking edges. The original specimen of the plates used in these experiments were 36 in. long and the rivets were driven at a pressure of 90 tons on a hydraulic bull riveter, the plates originally having been metal to metal which was the condition after the rivets had been driven and before any caulking had been performed. A fuller caulking tool was used on one side of the plate and a combination square and fuller caulking tool on the other side, both sides being heavily caulked to determine what results would be obtained. The condition resulting from the use of the fuller caulking tool only appears at *A* in Fig. 1, which clearly shows the separation occurring between the plates. A similar condition using a combination tool appears at *B* in Fig. 1, which shows no separation between the plates.

Since the avoidance of conditions contributing to intercrystalline corrosion is now an important factor in boiler construction, it is important that the plates remain in contact. This is evidently prevented by the use of a fuller caulking tool.

Since the publication of the 1940 reports, the Committee on Specifications for Materials, A. A. R. Mechanical Division has submitted recommendation covering specifications for rivet steel and rivets, applicable, however, only to carbon steel. In the interest of standardization, this committee suggests that favorable consideration be given to the adoption of these specifications which cover tolerances for both rivets and rivet heads. Where it is desired that any modifications in these standards be proposed, the secretary of the Master Boiler Makers' Association should be advised, details of the proposed changes being furnished with the reasons therefor.

Heating of Rivets

In its 1940 report the committee gave consideration to rivets and riveting and remarked that "Cold-made rivets are well suited to heating in electric rivet heaters." This committee is of the opinion that this type of heater does not produce the uniformity in heating that can be obtained with those forms of heaters having fire-brick lining designed for use with oil burners. Since, with the electric heaters, the ends of the rivets are heated first, it is apparent that there must be considerable variation in the temperature from one end of the rivet to the other. In order to secure proper and uniform filling of the holes, it is desirable that this condition be avoided. Proper expansion of the hot rivet in the hole and satisfactory formation of the heads may be obtained when the rivet is held between 1,800 and 1,900 deg. F.

Rivet Pressures

In the consideration of rivet pressures, it is necessary to distinguish between pressures per square inch of rivet diameter and pressures per square inch of the rivet hole. It is obviously necessary that the holes be increased beyond the normal diameter of the rivet in order to provide for expansion of the rivets under the temperatures to which they are heated and it is likewise necessary that the pressures be expressed in net tons actually applied to the rivet. Pressures at the accumulator may be substantially reduced because of factors introduced by the design of the bull riveter itself. The bull riveter is generally provided with a release mechanism which exerts a pressure opposite to that required in driving the rivet itself. Other factors also tend to reduce the net pressure of application below what it would be without these factors. These are friction of the parts both of the bull and the piston packing. Variation in these factors requires that their influence be determined so that the pressure actually applied to the rivet may be the net pressure after allowance for these factors. Obviously, it

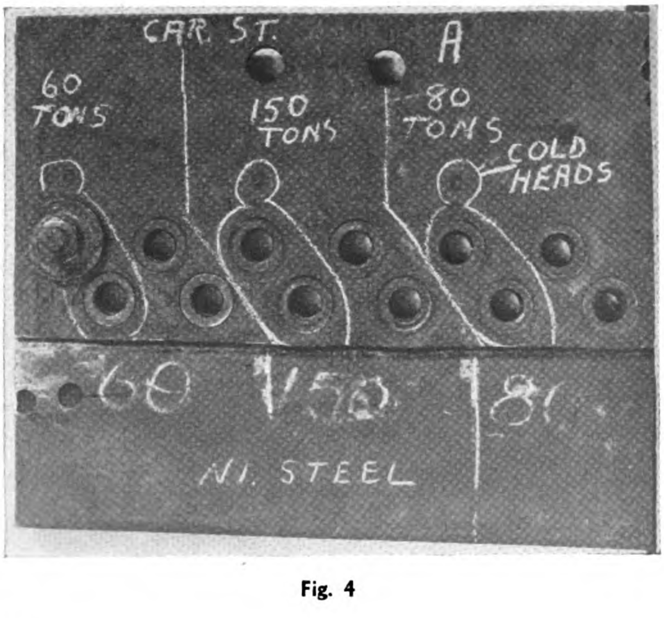


Fig. 4

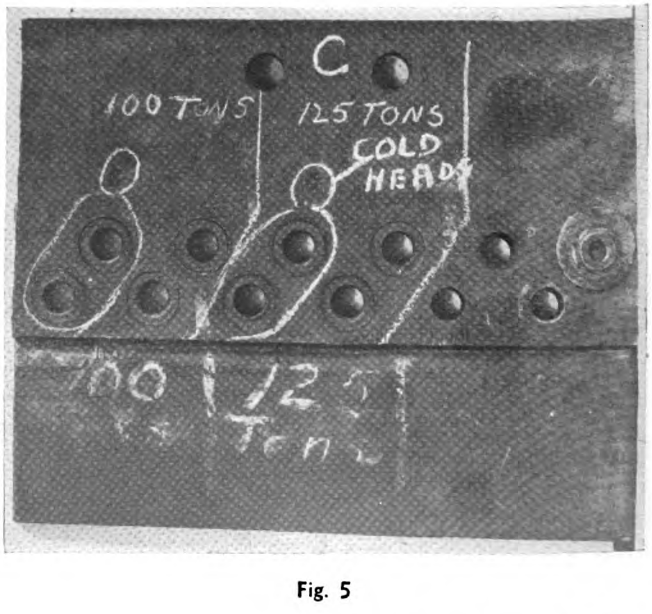


Fig. 5

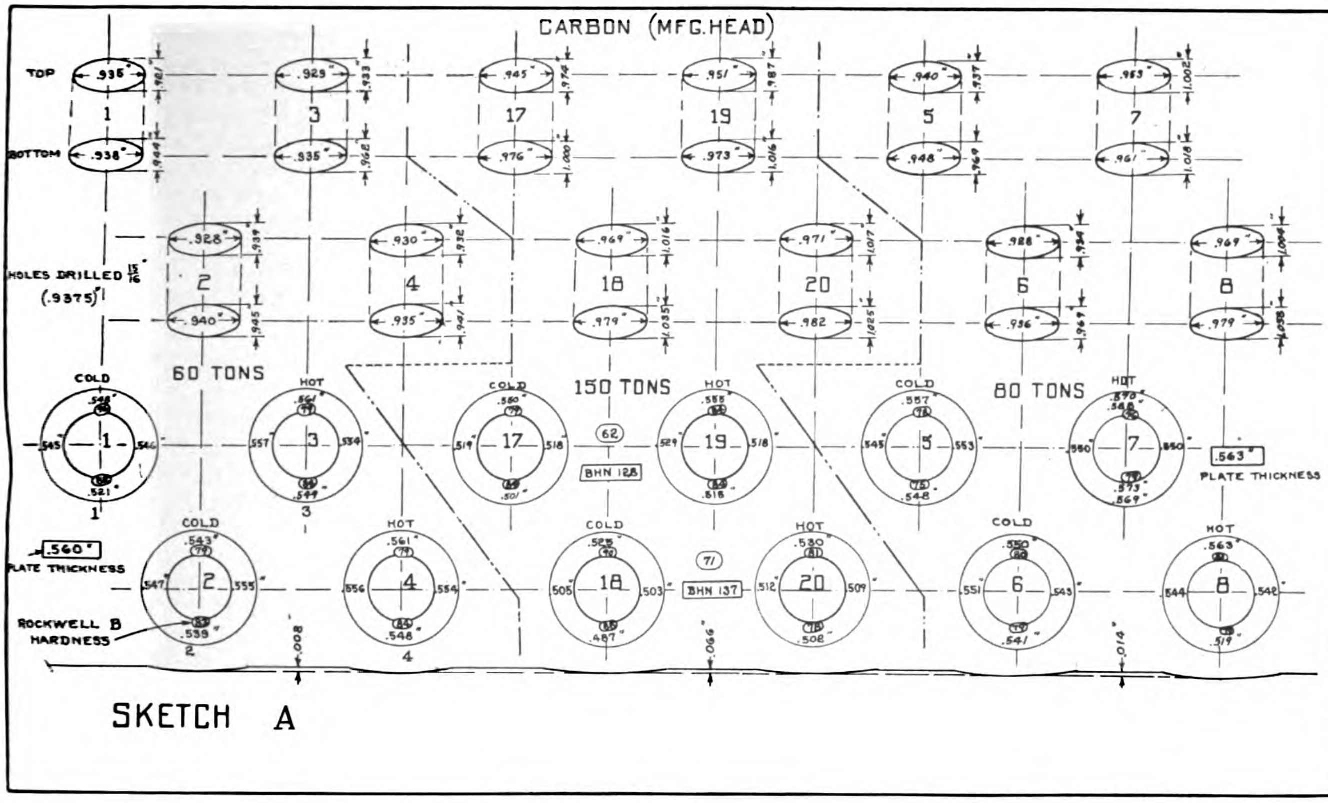


Fig. 6

is necessary that this determination be made separately for each bull riveter.

Experimental Data

In order to determine the effect upon plates produced by different riveting pressures, sections were made by the American Locomotive Company and tested with carbon-steel plates and carbon-steel rivets. The following photographs show the conditions which developed on driving carbon-steel rivets at the pressures shown.

Effect on Rockwell Hardness of Riveting Pressures

Temperature	Hole No.	Position	Transversely	Longitudinally
		60 Tons		
Cold	1	Top	0.935	0.921
		Bottom	0.938	0.944
	2	Top	0.928	0.939
		Bottom	0.940	0.945
Hot	3	Top	0.929	0.933
		Bottom	0.935	0.962
	4	Top	0.930	0.932
		Bottom	0.935	0.941
		80 Tons		
Cold	5	Top	0.940	0.937
		Bottom	0.948	0.969
	6	Top	0.928	0.934
		Bottom	0.936	0.969
Hot	7	Top	0.953	1.002
		Bottom	0.961	1.018
	8	Top	0.969	1.004
		Bottom	0.979	1.058
		100 Tons		
Cold	9	Top	0.966	0.937
		Bottom	0.951	0.949
	10	Top	0.965	0.960
		Bottom	0.991	0.979
Hot	11	Top	0.936	0.946
		Bottom	0.949	0.957
	12	Top	0.946	0.957
		Bottom	0.956	0.966
		125 Tons		
Cold	13	Top	0.926	0.943
		Bottom	0.945	0.969
	14	Top	0.960	0.962
		Bottom	0.977	0.996
Hot	15	Top	0.956	0.964
		Bottom	0.968	1.011
	16	Top	0.957	0.976
		Bottom	0.968	0.982
		150 Tons		
Cold	17	Top	0.945	0.974
		Bottom	0.976	1.000
	18	Top	0.969	1.016
		Bottom	0.979	1.035
Hot	19	Top	0.951	0.987
		Bottom	0.973	1.016
	20	Top	0.971	1.017
		Bottom	0.982	1.025

Figs. 2 and 3 show condition which developed on the surface of the plate after the rivets were driven at the several pressures shown in the photographs. Rivets which were driven with the temperature of the rivet on the cold side are encircled in white; whereas, those which are not encircled in white were driven at a more normal heating temperature.

Figs. 4 and 5 show the condition of the surface of the plate, including that under the head of the rivets, as well as the condition of the rivet holes. These rivets were carefully removed in the laboratory by machining and driving out.

Particular attention is called to the scalloped condition which developed to a minor degree at 100 tons and which appears more pronounced at pressures of 125 and 150 tons.

The sketches in Figs. 6 and 7 correspond with photographs in Figs. 2 to 5, inclusive. The Brinell hardness tests of the plate itself are shown, together with Rockwell B hardness tests of the plate in the area unaffected by the riveting pressures, as well as results in the area of the plate under the rivet head affected by riveting pressures. The Rockwell hardness tests appear to show variations approximately as follows:

Carbon Plate (Figs. 6 and 7)

Unaffected by riveting pressures, Rockwell B Hardness 62-73

Under head driving pressure Tons	Rockwell Hardness
60	79-86
80	75-81
100	78-89
125	76-93
150	78-90

Measurements were taken in two directions at the inner and outer side of the plate to show the amount of distortion of the rivet holes after driving rivets at different temperatures and pressures. The findings were as shown in the table.

Particular attention is invited to the variation in the thickness of the plate under the rivet head after being driven at the various pressures. The discrepancies observed are listed below:

Tons	Thickness 0.563 - Carbon Thickness under rivet, in.		Difference, in.
60	Cold	0.521—0.555	0.042—0.008
	Hot	0.548—0.561	0.015—0.002
80	Cold	0.541—0.557	0.022—0.006
	Hot	0.519—0.588	0.044—0.025+
100	Cold	0.503—0.554	0.060—0.009
	Hot	0.526—0.560	0.037—0.003
125	Cold	0.506—0.553	0.057—0.010
	Hot	0.511—0.560	0.052—0.003
150	Cold	0.487—0.550	0.076—0.013
	Hot	0.502—0.555	0.061—0.008

The results of this investigation appear to warrant the conclusion that the plate material is considerably affected at pressures of 125 and 150 tons, which obviously makes it desirable to hold rivet pressures below the higher of these two values.

The experience of the locomotive builders has indicated that a driving pressure approximating 85 tons per sq. in. of driving rivet area will provide sufficient pressure and suit the bull riveters now available to the builders. On this basis, the committee proposes the adoption of the following driving pressures which it will be observed do not exceed a maximum of 125 tons per sq. in. for the great majority of rivets required in modern boiler construction:

Diameter, in.		Area, sq. in.		Total pressure (tons) on rivet hole at 85 tons per sq. in.	Recommended tolerances
Rivet	Hole	Rivet	Hole		
7/8	15/16	0.6013	0.6903	58.675	55–62
1	1 1/16	0.7854	0.8866	75.361	60–80
1 1/8	1 3/16	0.994	1.1075	94.137	85–100
1 1/4	1 5/16	1.227	1.353	115.005	108–122
1 3/8	1 7/16	1.4849	1.623	137.955	131–148
1 1/2	1 9/16	1.7671	1.9175	162.987	153–164

The original assignment of this subject covered alloy materials both for plates and rivets, but since nickel is the alloy most generally used and since the defense program has affected the availability of this material, it has been impossible to make experiments for the verification of the existing, or the development of new, practices with respect to materials in which this alloy element is utilized.

The committee suggested the advisability of a trial of the recommendations that have been made and that a report be rendered in verification or otherwise of the standard practices which are proposed. This will permit a supplementary report to be made recommending standards of pressure and holding time for adoption by the A. A. R. Mechanical Division. This will require that the subject be continued and a report rendered to the Association in 1942.

[Note—The report included a table of allowable variations for carbon steel bars and tables of dimensions and tolerances for four styles of rivets.—Editor.]

The report was signed by A. G. Trumbull (C. & O.-P. M.); E. H. Heidel (C. M. St. P. & P.); Frank Yochem (Mo. P.); L. C. Ruber; G. C. Mullenhour (Lima Loco. Wks.); J. A. Graulty (American Loco. Co.) and Albert F. Stiglmeier (N. Y. C.).

Discussion

Several members raised a question as to the type of caulking tool that should be used. The majority favored the square-nosed design, though others favored the round-nosed type and a combination square- and round-nosed type. It was decided that the committee should give further consideration to this subject.

The discussion of this topic further developed that roads using high-pressure alloy steel boilers are experiencing considerable trouble with cracking around the caulking edge and rivet holes. It was suggested that a further study should be made to determine whether the cause may be poor workmanship, improper supervision, faulty materials, or incorrect boiler design. Some of the suggestions offered to eliminate leakage and cracking were: closer fitting of the parts, that is metal to metal; filling up the rivet holes; caulk the seams inside and out with a square-nosed tool and closer supervision of the workmen.

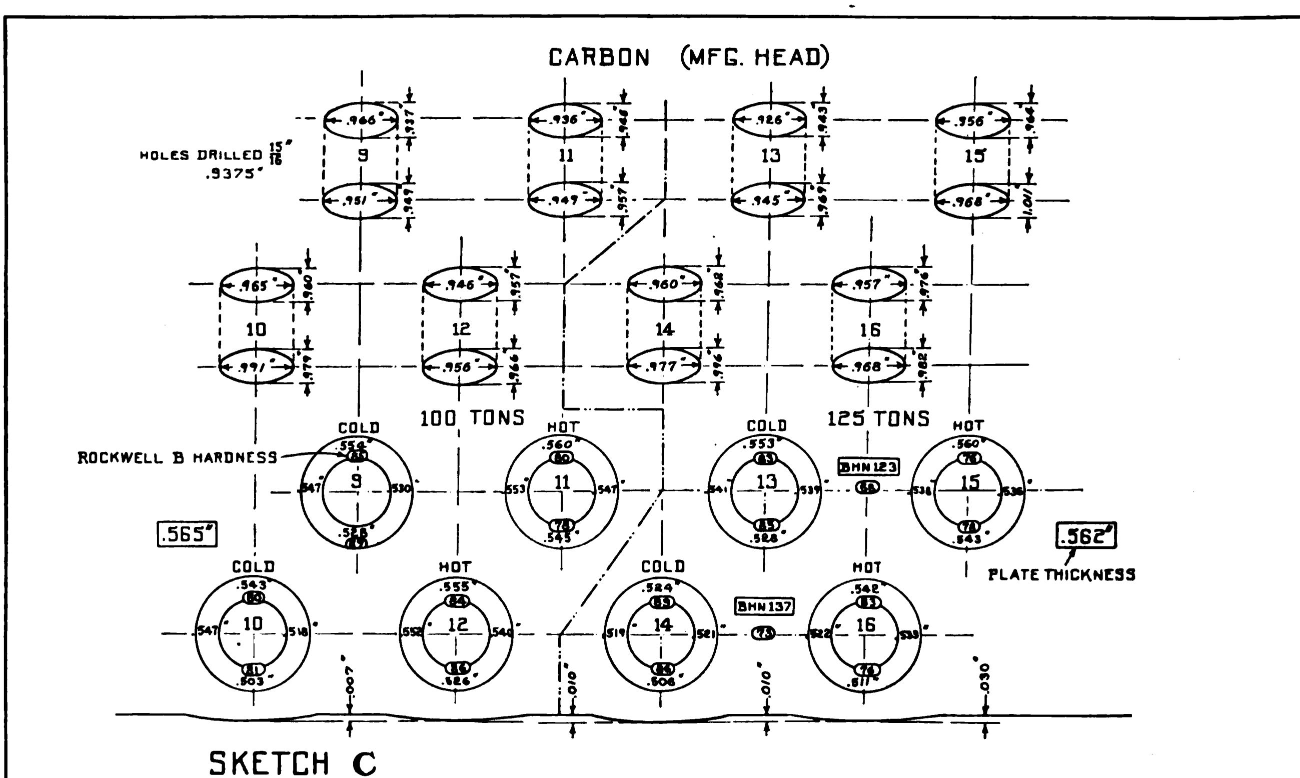


Fig. 7

Great Northern Cabooses

(*Continued from page 100*)

plates. The customary end ladders are supplied, with a safety railing at the roof end of the ladders.

The inside dimensions of the caboose are: length, 30 ft., width 9 ft. 2¼ in., height 7 ft. 4 in. The outside dimensions are: top of rail to top of caboose floor, 3 ft. 10⅜ in.; overall length, 37 ft. 6 in.; overall height, 14 ft. 8¼ in.; weight, 500,100 lb. The low floor line gave ample overhead room in both the body and the cupola without encroaching on clearances. The outside width was purposely made to about that of a standard box car for visibility and for safety in making running catches, the cupola being of the same width as the car body.

The outside body paint is Great Northern standard bright red, with gold colored stenciling and black trim. The underframe and trucks are black. Car cement was extensively used between and over the steel assemblies, also over wood parts where decay might start. The inside finish is varnish over natural wood, and the floor is painted with a deep red floor enamel.

In the body of the car there are four windows on each side and two in each end with shatterproof glass in the upper panel of end doors. All body windows are fixed except one side window on each side next to the conductor's desks. All caboose windows have double glass, set in sponge rubber to make the space between air tight. All body windows have shades and a rather unique screen door arrangement is provided. Two conductor's desks and seats, in diagonally opposite corners, enable the conductor to sit facing the rear of the train regardless of the direction in which the caboose is turned. In case of a sudden stop the trainman occupying the seat is thus jarred away from the desk, against the upholstered seat back and possible injuries are minimized. Facing the back, the conductor can keep watch for anything dragging and constantly keep oriented as to train movements. A look-ahead mirror outside the desk window, which is on the right side of train, also enables him to watch the approach to stations, block signals, etc., and to scan the side of the train.

Caboose Interior Streamlined

The wide interior makes possible a wide aisle with ample depth for lockers. In the streamlined interior, all unnecessary jogs are avoided; all corners are well rounded, and locker latches and other interior fittings are fully recessed. This eliminates the hazard of possible injury to men striking sharp corners and projections when thrown off balance. The built-in ice box has ample storage capacity. There are three large clothes lockers and a toilet room with hangers for rough clothing. All lockers and the toilet room have galvanized-iron-covered floors and interiors painted with white enamel. The toilet has a roof ventilator. There are two water coolers, one with a separate ice compartment for drinking water and a large one for wash water. The stove is a standard low-type Estate, equipped with a guard rail on each side fastened to the stove top. The stove pipe and jack are of No. 14 gage steel. The coal box is extra large and has a lid which may be used as a work bench for cleaning markers, etc. Aladdin lamps are used for light.

There are four metal bunks with metal floor linings, three of which are for bedding storage and have the interiors painted white enamel. The fourth has brackets for the storage of markers when not in use and is partitioned off for storage of brassing equipment and tools. Chains, cables, and other heavy equipment is stored in a weatherproof metal tool cellar underneath the car body.

The ladders leading up to the cupola platform are recessed. Handholds are attached to the seat, and a "monkey bar" extends longitudinally in the upper part of the cupola. The cupola seats are metal framed, upholstered, two on each side facing each other. There are four narrow end windows. The side windows are double sliding in weatherproof metal guides and so arranged that a trainman sitting in the cupola can slide the window forward, stick out his head to view the train, and yet remain firmly seated and protected against train shocks. A fold-back metal-frame cinder guard, attached between the windows, and a roof gutter protects against roof drippings. There is a standard fuse rack and torpedo box. Single emergency fuse clips are located on seat ends in the cupola and at each end door for quick emergency use.

Karl Fritjof Nystrom, D. Eng.

(*Continued from page 98*)

rehabilitation of boys and young men who have strayed from the narrow path and have gotten into serious difficulties of one sort or another, sorely needing a helping hand to restore their self respect and manhood.

Hobbies

The chief operating officer, concerned at Mr. Nystrom's close application to his work, suggested at one time that he let up a bit and learn to play golf. According to one of his friends, however, "his efforts were not very successful, for, while he made an attempt at golf, his clear cut misses of the ball were more numerous than his hits, which included a goodly percentage of tops, slices and hooks."

Mr. Nystrom has always been a lover of the out-of-doors and is fond of fishing. His principal diversion is working around his summer home at Lake Nagawicka, near Delafield, Wis. An interesting sidelight on his character is evident from the comments of one of his friends: "If you are there (Nagawicka) for long you are apt early in the morning to observe him strolling about the place quietly studying his bird friends that abound thereabout. They are all his friends; he never harms an innocent creature that God created for his joy. His thoughts seem always to be of construction and protection."

Mr. Nystrom is an active member of the Methodist Church.

In Conclusion

"Doctor of Engineering!" What different connotations this title has today as compared to the time when Mr. Nystrom was graduated from college. One considered the "Dr. Engr." in those earlier days as a man of a high degree of technical learning and accomplishment—as a sort of rare chap to be found back in the laboratory or the class room—a great designer, a researcher, a scholar in the field of applied science.

In these later days it may still mean that, or it may stand for something more, something virile, something dynamic that leads men and develops their potentialities, as well as harnessing the forces of nature and utilizing its materials. And to those scientists and engineers, who are outstanding leaders of men, also, we bow in humble admiration.

A. A. R. Acts to Conserve Critical Materials

(*Continued from page 92*)

vention of train delays, safety, health, sanitation and fire prevention.

Exhibit B—List of items made of rubber or containing rubber regarding which a substitute is recommended. This list includes those items the uses of which are presently not so important, such as cost, comfort, convenience or where conditions do not warrant present standards.

Exhibit C—List of items made of rubber or containing rubber regarding which a partial substitution may be made but concerning which it is necessary to conduct further investigation before making definite recommendations.

Due to inability to attend our meeting on account of presence in Washington of the Technical Committee of the Rubber Manufacturers' Association, we are unable to include at this time the per cent reduction in rubber. As information and other materials are developed it may be possible to transfer some of these to Exhibits A or B.

Hose

With respect to hose, the following special recommendations are submitted:

1—Reduce length of hose now in use all possible and return the excess to the store stock.

2—Reduce length of hose to the absolute minimum by additional pipe lines and outlets.

3—Eliminate hose entirely by the installation of pipe lines and flexible metallic joints for yard heating and charging lines, oil handling installations, boiler washing and filling, and wherever practicable.

4—Use flexible metallic hose wherever possible in carefully installed permanent installations where there are no torsional stresses.

5—Prevent injury to hose during application of fittings by close supervision.

6—Prevent injury to hose by trucks and other vehicles by the use of protective planking, overhead hangers or other means and, if necessary, by relocating outlets.

7—Salvage hose all possible by removing any damaged portion and coupling or splicing serviceable lengths.

8—Uncouple air-brake and air-signal hose before parting cars.

9—Air-brake hose should not be removed from service except as required by Interchange Rule 56.

10—Check rolling stock periodically and return to store stock excess quantity of emergency hose.

The secretary is requested to refer to the Committee on Specifications for Materials and Committee on Brakes and Brake Equipment the suggestion that the thickness of end caps of air-brake and air signal hose be reduced or caps eliminated entirely by using an adequate sealing compound.

Insulated Wire and Cable

These items are referred to the Electrical and Signal Sections but, after consultation with wire and cable manufacturers, we recommend considering the following:

*1—Use copper wire of the smallest circular mil which will carry the required current and thus effect reduction in both copper and insulation.

*2—Use paper or varnish cambric insulation wherever permissible.

*3—Substitute synthetic or asbestos insulation for special installations.

*4—Reduce rubber content to the limit of safety.

5—Reduce length of extension cords, welding and battery-charging cables and all portable cords and cables to the minimum.

6—Repair portable cords and cables by splicing and vulcanizing.

Storage Batteries and Parts

These items are referred to the Electrical and Signal sections but, after consultation with the manufacturers, we recommend consideration of the following:

1—Discontinue purchase and change existing orders for monobloc or similar container assembly of car-lighting and air-conditioning batteries and use wood tray and rubber jar assembly, thereby effecting a saving of approximately 60 per cent in crude rubber for containers.

2—Reduce the number of sizes of car-lighting batteries to four or five. Consider standardizing to 300, 450 and 600 amp. hrs. and the largest wood tray assembly which can be installed in the standard A. A. R. compartment. The latter size may be from 800 to 1,000 amp. hr. capacity, dependent upon the thickness of the plate used by the manufacturer.

3—Standardize on the size and reduce the number of sizes of cable.

4—Discontinue the use of abnormally long inter-tray connectors now used to permit servicing of batteries without disconnecting them.

5—Assign partially exhausted batteries, i. e., 80 per cent of rated capacity, to an installation of lighter duty where the reduced capacity is ample for the service.

6—Save cable, connectors, containers, jars, etc., for use in repairing batteries.

7—Return to the manufacturers old batteries and excess parts for use in rebuilding.

8—The Edison Storage Battery Division are studying synthetic resin-like materials in place of rubber for electrical insulation in alkaline solutions.

Reclamation of Rubber

1—All rubber products when not in active use should be stored in a cool, well ventilated location and should not be exposed to sunlight.

2—Use rubber products in rotation according to receipt in storerooms so as to reduce deterioration due to age to a minimum.

3—When overhauling devices or equipment containing rubber parts, careful consideration should be given to the condition of such parts and return them to service if warranted rather than to replace regardless of condition simply because of servicing the device.

4—Check shops, enginehouses, yard buildings and supply boxes periodically for excess quantities of packings, gaskets, discs, washers, diaphragms, etc., and return excess to store stock.

5—Check the use of rubber matting in unnecessary locations so as to make available for essential purposes.

6—No rubber scrap of any kind should be burned or otherwise disposed of. It should be accumulated and sent to one or more central points on the railroad for reclamation and manufacture into gaskets, stripping, mats, stops, bumpers, sleeves, protective coverings or in place of new rubber parts or parts of which rubber is a component.

7—The practice of burning insulation from wire should be discontinued. All insulated wire returned to scrap docks or reclamation plants should be carefully inspected and usable portions recovered for further use. Such wire as is beyond reclamation should be stripped of its insulation and the copper and rubber recovered.

* These four items are subject to the requirements of local and national code authorities.

EDITORIALS

There Must Be No Letdown!

As sufficient weeks of 1942 have elapsed to give some indication of the trend of railway freight traffic it seems apparent that the freight-car loadings which the railways will be required to handle this year are going to exceed those of 1941 by somewhat more than 10 per cent. A 10-per cent increase in car loadings was the basis for many of the estimates made during the latter part of 1941 to determine the amount of new motive power and rolling stock which would be needed during 1942 to insure the free movement of the commerce of the nation. Car loadings during the first seven weeks of the current year amounted to 5,423,000, an increase of 11 per cent over the number of cars loaded during the similar period of 1941.

Several aspects of the car and locomotive situation indicate the relative shortness of the supply of equipment, and at the same time tell a story of steadily growing efficiency of utilization which throws into the discard all previous indices for measuring the capacity of the railways' supply of locomotives and freight cars. For instance, the percentage of freight cars on line undergoing or awaiting repairs, which reached the unprecedented low of 4.1 during the late fall, had dropped still further to 3.8 by the middle of January. The per cent of freight locomotives out of service for class repairs, which had dropped steadily from 17.4 since the fall peak of 1940, was 10.7 during October, 1941, and had gone on down to 9.4 in January, 1942. The average daily mileage per serviceable freight locomotive increased from 113.8 in October, 1940, to 124.3 in October, 1941. The upward trend in the utilization of serviceable freight cars is even more striking. The average daily mileage per car was 41.7 during October, 1940; it went up to 46.9 during October, 1941. The overall effectiveness of the freight car as a traffic mover is reflected in net ton-miles per car day which increased from 666 in October, 1940, to 852 in October, 1941—over 27 per cent.

Whether one interprets these as marked improvements in the utilization of freight motive power and rolling stock or as evidences of growing strain on the railroads, it is clearly evident that to maintain the standards already attained and, if possible, to raise them still higher, is going to require the utmost care on the part of all equipment maintenance forces. There must be no letting down in the high standards of maintenance which now prevail. Loaded freight cars must be kept off repair tracks as long as they are safe to run, but when cars go in for repairs they should be put in condition to stay off repair tracks for a long time. Similarly, when locomotives are withheld from service for monthly inspection, nothing should be neglected which will keep them off the work reports for the next thirty days. And when locomotives are turned out of the shops after class repairs there must be no doubt as to the effective restoration of the full mileage quota. Slipping backward at any of these points will inevitably cause a reversal of the present encouraging trend in the ton-mile-producing capacity of freight cars and locomotives.

Why Not Railroad "Shop Engineers"?

For years it has been one of the popular pastimes of the critics of the railroads to draw comparisons of the manner in which things are done in this business with the way they are done in other industries that are reputed to be much more efficient. Almost since the first day that the automotive industry started to produce parts and perform assembly operations on a mass production basis there have been those who have expressed the opinion that if the railroad shops would adopt the methods of the automotive plant the efficiency of our repair plants would be greatly improved.

Before it is safe to express a positive opinion it is usually considered worth while to gather the facts necessary to arrive at a conclusion. The critics of the railroad repair shops have often expressed the opinion that they are obsolete in equipment, haphazardly arranged and inefficiently operated. On the other hand there have been many opinions offered in an attempt to prove that such is not the case. The question we would like to raise at this time is, "Upon what conclusive facts do the critics and the defenders of railroad shop practices base their opinions?" Possibly it might be worth while to review some of the evidence that has been brought out in this "case" over a period of many years.

Who are the critics of railroad shop operating methods? They may be divided roughly into two classes: one group made up of those whose contact with other industries—usually in a sales or service capacity—has caused them to be impressed by the differences in facilities and practices existing between the railroad and industrial shop, and another group made up of those who have made a sufficiently thorough study of the problem to have convinced themselves that there is room for marked improvement in railroad shop operation.

What are the basic characteristics of the criticism

that has been offered? The first-mentioned group of critics has emphasized the need for more modern equipment; mass-production methods of manufacture and assembly; the use of more jigs and fixtures to speed up operations and reduce the cost thereof; the use of modern cutting steels and, among other things, the setting up of a depreciation reserve out of which replacement equipment could be purchased in sufficient quantity to maintain a satisfactory "average-age" condition with respect to machine tools and shop equipment. As to the second group of critics, they have included all of the above items in their criticism and have added the opinion that without the recognition by management of the importance of this shop problem and its support in remedying certain conditions there is not too much hope for a satisfactory solution.

Why the Critics Fail to Convince

If the critics are guilty of anything at all it is that the first group has not taken the trouble to study the problem as thoroughly as the second group and the second group has not taken the trouble to inform their own managements concerning certain fundamental facts. Unfortunately both groups have done most of their work in the dark for an examination of certain conditions surrounding railroad shop operation will convince almost anyone that the necessary facts with which to draw conclusions and to express opinions do not exist with respect to the railroad industry as a whole. The reason why they do not exist is that, with a few important exceptions, the railroads have never considered such facts important enough to justify the expense necessary to secure them.

If there is any one thing in which the automotive and general industrial field can be said to have done that the railroad industry has not done, it is the development and encouragement of shop and tool engineering. It is the shop and tool engineer who made the automotive industry and it is these same experienced men who are converting that industry almost overnight into war production plants that are already turning out the things we need to win the war.

What is a shop or production engineer and what is his function in an organization? Definitions may differ but fundamentally a shop or production engineer is one who takes certain facilities, a given number of man-hours of labor and quantities of materials and works out a production plan whereby these elements are so utilized that the greatest number of completed units are turned out at the lowest possible cost consistent with a predetermined standard of quality. The function of such an engineer in an organization is to procure the facilities required by the production plan and advise the management as to the number of men and the quantities of material needed to perform the job. Needless to say the production or shop engineering department of an industrial organization could never perform its functions without having vested in it the necessary authority to the exercise of control over the detail manner in which its plan is carried out.

Does the railroad industry have this type of engineering? Before attempting to answer such a question it may be well to define the job a railroad is called upon to do. A railroad produces transportation service measured in ton-miles rather than automobiles, refrigerators, radios or electric light bulbs. Until the ultimate consumer decides to buy and the manufacturer decides how much he will produce, a railroad has no idea how much service it may be called upon to perform. Likewise the railroad repair shop has very little idea, in advance, how many locomotive-miles or car-miles it may be called upon to restore in the form of repaired or rebuilt cars or locomotives. So, the answer to the question may be that the production engineer of the railroad industry may be found, under another name, somewhere in the transportation department which, after all, is the place where railroad service is produced. The railroad repair shop is the place where the tools of transportation are kept in condition to do the job. It is important to note here that the job of a railroad shop is not a "production" job but a repair job—always presenting a problem in which the unknown factors are in the majority.

Does the Railroad Need the Shop Engineer?

Does the railroad industry need the shop engineer? In considering this question it is worth while to place considerable emphasis upon the facts that the railroad repair shop is dealing with all of the elements of production that an industrial plant is—facilities, man-hours and materials—plus an element that is more difficult to handle and one which complicates the problem more than anything else, namely, the impossibility of predicting accurately in advance, what the extent of the job will be; in other words, the unknown factors. When the complexity of the railroad shop problem is considered and to that is added the fact that, except in a few instances, no single individual or group in the shop is charged with the responsibility of planning shop operations as a whole and given the authority to procure the facilities and control the details of such a plan, it is remarkable that most of our shops operate as efficiently as they do. If there is any industry that could make use of the science of shop engineering it would seem that it should be the railroad industry for there, unlike a production industry, the unknown factors in the shop problem make careful planning an extremely important requisite.

In conclusion, it may be important to point out again that the single item of locomotive repairs (Account 308) is the largest item of railway operating expense. In-as-much as the facts do not exist to prove that this money is or is not being spent efficiently it might be worth while to find out. In most industrial plants the production or shop engineer could answer such a question with respect to his operations, and back up his answer with facts to prove it. Who would you ask in the railroad industry?

Conditioning Steel Car Surfaces Before Painting

One of the subjects, briefly but effectively covered at the last annual meeting of the Car Department Officers' Association, was the treatment which it is necessary to give both old and new steel surfaces of passenger cars preparatory to painting, and many of the comments, of course, apply equally well to freight equipment. While nothing startlingly new was developed in the short and more or less extemporaneous discussion presented by Harry Stahnke, painter foreman, New York Central, West Albany, N. Y., a number of the points which he made need to be constantly restated and emphasized.

Of the three different methods used to remove paint, namely, employment of an alkali stripper, paint remover, or sandblasting, the last is generally most feasible and highly effective since it removes paint, mill scale and rust and no other treatment is necessary preparatory to painting. In the case of liquid removers, the steel surfaces can be put in condition for painting by the use of a neutralizer, several of which, now on the market, are available and can do a good job. Experience indicates, however, that cost is a limiting factor in the use of paint removers where quantity production is required. When an alkali stripper is used for removing paint, it tends to get between the joints of steel sheets and shapes and, in spite of the utmost care in subsequent cleaning, traces of the alkali are liable to remain in these joints and disrupt the protective coating of paint after it has been applied.

Regarding the effect of mill scale on paint durability, Mr. Stahnke said, "It is the thought of many that there is not so much danger of trouble from mill scale as there is from common rust, but I think mill scale is just as much trouble, especially on the exteriors of cars. Mill scale will work loose with temperature changes and cause breaks in the paint, admitting moisture and causing corrosion. For this reason, mill scale should be removed, which can be done only by sandblasting." Mr. Stahnke went on to say that the expense of cleaning steel preparatory to painting should be regarded as an insurance against premature breaking down of paint finish which permits corrosion to develop.

It is obvious that rust also must be removed before a good paint job is assured, otherwise the deterioration of the steel will progress under the paint and proportionately decrease the life of the equipment. The points are made that paint should be applied directly to the surface to which it is meant to adhere and any good paint applied to a clean surface will outlast the best paint applied to a dirty or rusty surface. Once steel surfaces are placed in condition for painting, an elementary precaution is to get the paint on before any of the good work is undone by oxidation through exposure of the equipment to the elements.

When cars are received in the paint shop, the priming coats are applied and as many surfacer coats and putty and knifing as required, dependent upon the finish desired. Most railroads are now using either a lacquer or synthetic enamel for exterior finishing coats, which has caused some difficulty in keeping lettering, especially of the gold leaf-type, in satisfactory condition without renewing it between shopping periods. Apparently there is no size which will adhere to either lacquer or synthetic enamel perfectly; the pencil varnish breaks down under frequent washing, so the gold letters soon deteriorate.

One of the methods now successfully employed to overcome this difficulty is the spraying of letters, using a special mask and either lacquer or synthetic enamel, whichever comprises the finish coats on the exterior of the car. By using the same kind of material for lettering and finish coats, the lettering knits with the finish coat and both give the same service. Regarding this practice, Mr. Stahnke said, "We have been applying lettering by this method for a little more than a year and to date I have not seen any cars with the lettering wearing off and have not had any complaints from any source about having to renew letters due to lettering coming off where cars are washed."

In view of the importance of developing and broadcasting information regarding the best practices in painting railway equipment, as well as suitably preparing metal surfaces before application of the paint, it is hoped that the Car Department Officers' Association will be successful in its present plans to develop a competent committee on this subject and present a report for publication in its next annual year book which will contribute further to the knowledge of this subject.

New Book

LOCOMOTIVE CYCLOPEDIA. *1941 edition.—Compiled and edited by Roy V. Wright and Robert C. Augur under the supervision of an Advisory Committee of the Association of American Railroads, Mechanical Division. Published by the Simmons-Boardman Publishing Corporation, 30 Church street, New York. 1,312 pages, 9 in. by 12 in. About 4,000 illustrations. Price, $5, bound in fabrikoid.*

Many new designs of locomotives (steam, electric, Diesel and industrial) and appliances developed since the publication of the 1938 edition of the Locomotive Cyclopedia are included in the eleventh, or 1941 edition. While the same general arrangement has been followed, the material has been made more readily accessible by a more clearly defined division of sections and a somewhat altered arrangement. The list of contents by sections and subdivisions and the alphabetical index to locomotive parts have been improved, and on the first page of each section appears a summary of its contents. A revision has also been made in the figure numbers for the illustrations. While improvements in shops and engine terminals since 1938 have not been extensive, the section on Locomotive Shops and Engine Terminals has been revised and a chapter on welding and cutting added.

Tool Loads And Carbide Tools

By Paul H. Miller*

One of the most common erroneous beliefs in connection with the adoption of carbide cutting tools to speed production, is that the higher cutting speeds recommended for such tools impose greater forces on the work and tool. Actually, the opposite is the case more frequently than not.

Many a shop man has hesitated to use carbide tools for such reasons as: (1) A belief that the increased rate of metal removal will increase the tendency for the work to slip in the chuck; (2) That it will be necessary to tighten the chuck too much to prevent slipping and thus distort the work; (3) A belief that the increased cutting speed will cause long work to 'twist up' to a greater extent and (4) That there will be an increased tendency to distort thin wall (hollow) parts, etc., due to increased pressure of the tool against the work.

Table I — Constants for Calculating Power Requirements and Tool Loads for Various Materials

Material	Power Constant
SAE 1010-1025	6
SAE 1030-1095	8
SAE 1112-1120	6
SAE X1314-X1340	6
SAE T1330-T1350	9
SAE 2015-2320	7
SAE 2330-2350	9
SAE 3115-3130	8
SAE 3135-3450	9
SAE 4130-4820	9
SAE 5120-52,100	10
SAE 6115-6195	10
Cast steel	9
Cast iron, hard	4
Cast iron, medium	3
Cast iron, soft	3
Cast iron, hard (alloy)	4
Cast iron, medium (alloy)	3
Cast iron, soft (alloy)	3
Cast iron, up to 25 per cent semi-steel	3
Cast iron, over 25 per cent, semi-steel	4
Cast iron brake drums	4
Cast iron chilled rolls	5
Malleable iron, hard	5
Malleable iron, medium	4
Malleable iron, soft	3
Brass and bronze, hard	10
Brass and bronze, soft	4
Aluminum castings	3
Aluminum bar stock	4
Copper	4
Commutators	4

The basis of such beliefs is probably the fact that the increased rate of metal removal by the machine, when carbide tools are used and the machine is speeded up, involves in turn an increase in the amount of horsepower required.

Actually, the increase in horsepower required may be accompanied by a decrease in tool loads and torque, as simple basic engineering considerations demonstrate.

What Determines Tool Load?

For a given set-up tool loads, pressure on the tool and by the tool on the work are determined by two major factors: The cross sectional area of the chip, and the nature of the material being cut. It can be expressed by a simple formula:

$$W = F \times D \times K \times 33{,}000$$

in which

W = total tool load, lb.
F = feed, in.
D = depth of cut, in.
K = constant for material (see Table I)

* Chief engineer, Carboloy Company, Inc.

The value of the constant varies from 6 to 10 for different classes of steel, and from 3 to 5 for different types of cast and malleable irons. For all, except the extremely hard bronzes and brasses, the constant is around 3 to 4. For the hard-to-machine non-ferrous metals, it may run as high as 10.

Irrespective of the value of this constant, however, it will be noted that the actual tool load is to all practical purposes independent of cutting speed.

Cutting Torque

To determine the cutting torque, which determines also the amount of twist or the tendency of the work to slip in the chuck, etc., it is necessary only to multiply the tool load figure by the distance of the tool from the center of the work. Again it will be noted that speed has nothing to do with the subject.

Calculation of the Horsepower Required with Carbide Cutting Tools

The reason that more horsepower is required with carbide tools at higher cutting speeds is shown by the formula:

$$\text{Hp.} = \frac{W \times C}{33{,}000}$$

in which

W = tool load, lb.
C = cutting speed, ft. per min.

or by the formula:

$$\text{Hp.} = D \times F \times C \times K$$

in which

D = depth of cut, in.
F = feed, in.
C = cutting (or surface) speed, ft. per min.
K = constant for material (Table I)

This formula makes it evident that, even when the tool load is kept constant (that is, the feed and depth of cut are unchanged), the horsepower required increases whenever the speed is increased. This is the horsepower required for actual cutting.

To determine the total amount of motor horsepower required by the machine when switching to carbide tools, it is of course necessary to add to the above figure the horsepower lost in driving the machine itself at the higher speeds recommended for carbide cutting tools. This is usually estimated at around 30 per cent of cutting horsepower.

The Horsepower Is Higher But The Torque Is Lower

Actually in a great many cases when a job is switched from high-speed steel to carbide tooling, the amount of torque and the tool loading is decreased. As a matter of fact, in some cases, particularly on extremely large work, it is actually necessary to decrease the tool load to make the carbide tools perform properly.

Carbide tools, inherently, cannot take as great a maximum loading (pressure) as can high-speed steel tools. On extremely large work where slow speeds have been used with deep cuts and large feeds, it is sometimes necessary to decrease the feed to prevent tool breakage. This decrease is, of course, more than made up in metal removal by the increased speed at which the cutting is done.

For instance, let us take a typical large job tooled with high-speed steel tools with the following performance:

Outside diameter of work, in.	36
Depth of cut, in.	½

Feed, in.	$^3/_{16}$
Maximum cutting speed, ft. per min.	40
Horsepower required for cutting	22½

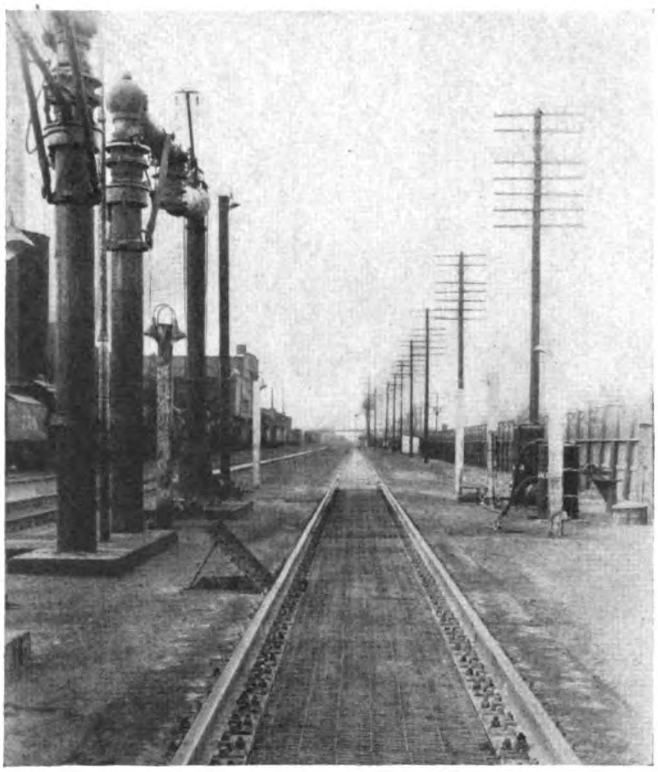
The amount of metal removed here is 45 cu. in. per min. (½ × 3/16 × 40 × 12).

When this job is tooled with carbides, let us assume the following operating conditions:

Depth of cut, in.	½
Feed, in.	reduced to $^3/_{32}$
Cutting speed, ft. per min.	raised to 125

Here is what has happened. The amount of metal removed is now 70 cu. in. per min., a gain of 55 per cent. The horsepower required for cutting has been increased to around 35, an increase of 55 per cent. But tool load, or pressure, has been reduced 50 per cent since the feed and, therefore, the cross section of the chip, is reduced by 50 per cent, and the torque on the work and the chuck has also been reduced by 50 per cent for the same reason.

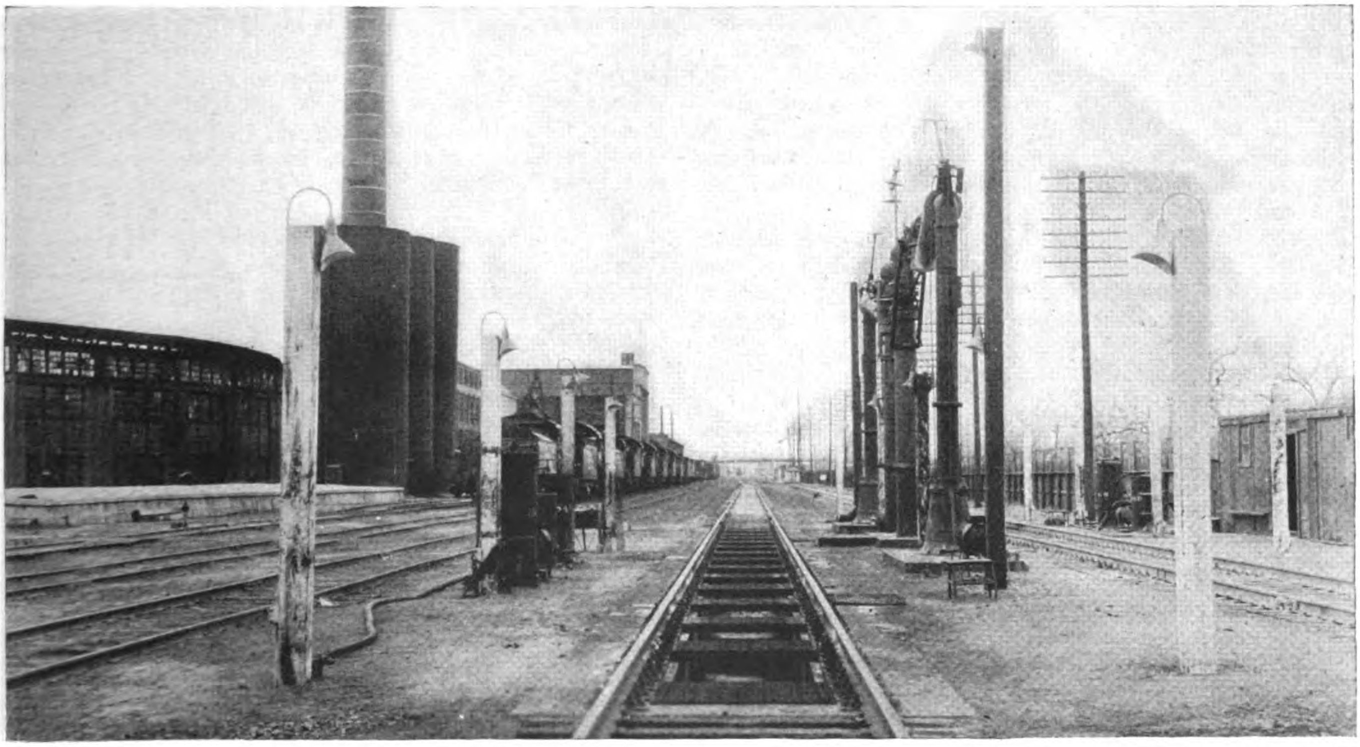
Thus, while the rate of metal removal and the horsepower required have gone up, the tendency of the work to slip in the chuck has been cut in half; the tendency to twist has been cut in half and the tendency to distort the work by cutting pressure has also been reduced 50 per cent. At the same time, finish has been improved by means of the finer feed used; tool life between grinds has been increased due to the harder carbide tools and the amount of down-time has been decreased in proportion.



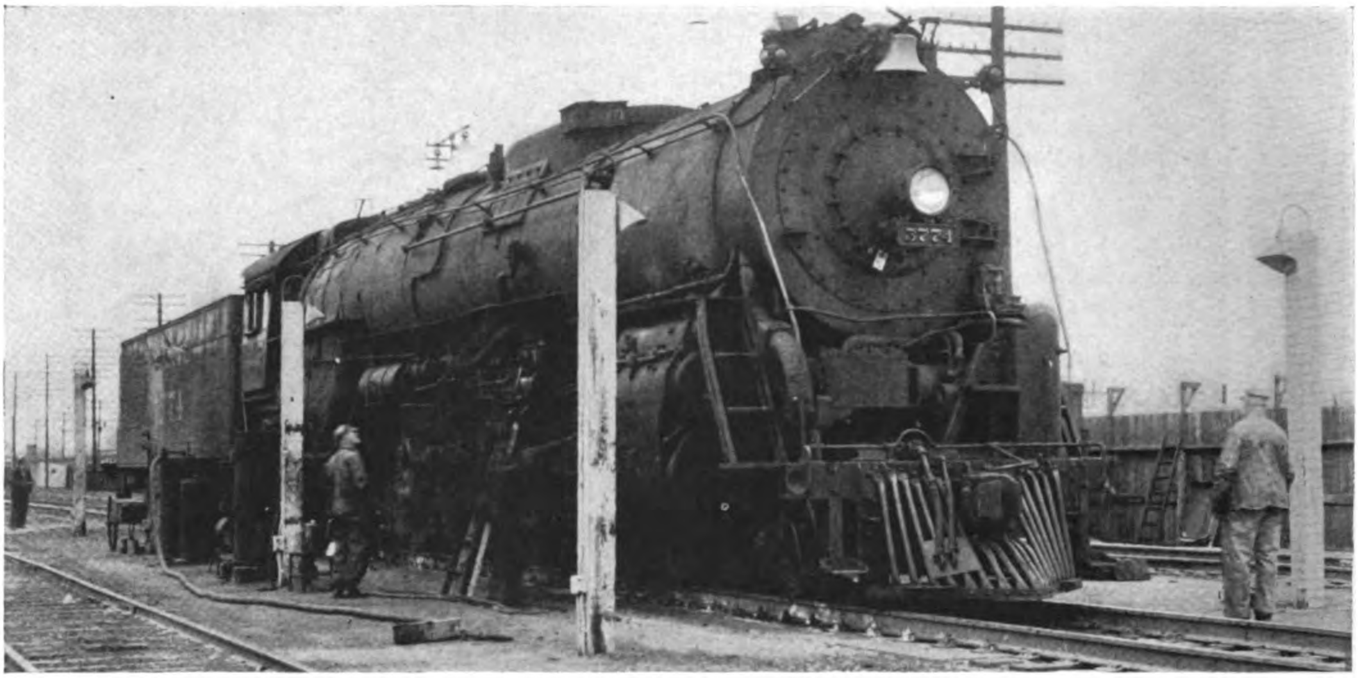
One of the pits showing protective grating—The entrance-way grating cover is partially raised

Albuquerque Locomotive Inspection Pit

The locomotive inspection pit, illustrated, is located opposite the enginehouse on the main line of the Atchison, Topeka & Santa Fe, a short distance west of the station at Albuquerque, N. M., where it saves labor and reduces time in servicing through locomotives. The principal feature of this combined inspection pit and locomotive servicing station consists of four standpipes or cranes, the two outer ones supplying water and the two inner ones fuel oil. These cranes are located midway between the two main-line tracks so as to serve locomotives on either side. Two inspection pits, 120-ft. long by 38-in. deep, are located in the main tracks adjacent to the fuel and water cranes. They are staggered 45-ft. with respect to the cranes, so that when spotted at the cranes from either



Fuel oil and water standpipes, lighting facilities, pits, etc., at Albuquerque, N. M.



A locomotive being serviced on one of the inspection pits of the Atchison, Topeka & Santa Fe at Albuquerque, N. M.

direction, both the locomotive and its tender are over an inspection pit.

With these large-capacity cranes, a 7,000-gal. fuel tank and a 20,000-gal. water tank can be filled simultaneously in an average of about five minutes. During this time other necessary servicing, inspecting and lubricating work is also done. Altogether, this takes an average of about seven or eight minutes for a large locomotive. Trains from the West are stopped with the locomotive over the inspection pit long enough for this work to be done. In the case of trains from the East, the locomotives are uncoupled at the station and moved down to the inspection pit for servicing, while the cars at the station are loaded with baggage, mail, train supplies, etc.

As a safety measure sectional grating is placed between the rails when the inspection pits are not in use. These grating sections can be easily removed and may be piled one on the other, or slid along the tracks in any way to suit the inspectors working under locomotives. Access to each inspection pit is had by means of an entrance way, 3½-ft. wide by 5-ft. long, outside the track. This is also covered with a grating.

Other fixed facilities at this modern locomotive servicing station include a large cylindrical sand-supply tank for each track; air-storage drums installed in the yard air line to avoid fluctuations of pressure when filling grease cups; a steam-heated box through which air lines pass to warm the air slightly and eliminate moisture condensation in severe cold weather; and a long supply house or shed located next to the outer fence, containing additional dry sand, soaking vats for packing, heater oil cans and journal grease, carbon cleaning tools, telephone, and rest room for crews.

The entire inspection pit area is exceptionally well lighted for night operation. The 200-watt lamps and reflectors on two tall poles, between the tracks, throw light on sand domes and facilitate the work of men who supply sand. Four short poles, also equipped with 200-watt lamps and reflectors, are spaced on 30-ft. centers and located along the side of each inspection pit so that ample light is available to inspect the lower parts of the locomotive, including all motion work parts and running gear.

When a locomotive is received at the inspection pit for servicing, men are assigned to fill the fuel tank, water tank, sand dome, mechanical lubricators, etc., simultaneously. A hand test of all bearings is made and if any are hot enough to indicate the possibility of serious trouble before reaching the next terminal, the locomotive is cut out and sent to the enginehouse. All friction bearings are lubricated; rod cups are filled with grease by means of a grease gun using air from the engine on the left side and yard air on the right. The firebox is checked for carbon on the fire-brick wall, any accumulation found being removed by the special tools mentioned. All motion parts, running gear, wheels, etc., are inspected; cab windows washed, etc.

As a rule, two inspectors work at the same time, one underneath the locomotive and the other on the outside. The total time required for servicing a large locomotive is from seven to eight minutes, as stated, and the crew comprises 16 men, including the foreman, two mechanical inspectors, one pipefitter, and one boilermaker. The rest are helpers and laborers. These men are regularly employed in the enginehouse nearby and come to the inspection pit only a few minutes before a locomotive is due, leaving it immediately after the servicing operations have been completed and the locomotive sent on its way. This locomotive servicing layout has saved considerable time and labor in the actual servicing operations, but by far its greatest advantage has been the conservation of locomotive hours formerly spent going to and from the enginehouse and, hence, not available for the movement of trains.

Short-Turning Shop Truck For Light Loads

A small shop truck, with a short turning radius and small over-all dimensions, is being built by the Buda Co., Harvey, Ill. The truck can be turned in a radius of 7 ft. 3 in., weighs 800 lb., with a load capacity of 1,000 lb., has a loading area of 12.8 sq. ft. and a maximum speed of 15 m.p.h.

The Chore Boy is driven by a 4-cycle, air-cooled, 7.7 hp. engine and is said to be low on fuel consumption,

averaging 35 miles per gallon of gas. Magneto ignition is used for starting; a friction drive with forward and reverse speeds and a neutral position for idling is hand-controlled by the operator. The brake is of the internal

Buda "Chore Boy" with a load of rerailers

expanding type on an intermediate shaft and is applied by a standard brake pedal. A seat control also locks the brakes when the operator is off the seat. The power unit drive is located under the driver's seat and is readily accessible by opening a hinged cover which exposes the entire unit.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Cracking in the Throat-Sheet Knuckle

Q.—We are having considerable trouble with the throat sheets of our eight-wheel switching locomotives cracking in the knuckle. What causes these cracks and can it be remedied? Is it satisfactory to repair these cracks by welding?—M. I. T.

A.—Cracking of the throat sheet in the knuckle is generally caused by the expansion and contraction of the boiler when it is being fired up and cooled down. Rapid firing up and cooling down of the boiler exaggerates this condition and should be avoided.

The rigidity of the boiler construction at this point due to the connection between the shell, the firebox wrapper sheet and the throat sheet being in such close proximity to each other limits the free expansion of the boiler at this point setting up excessive strains in the throat sheet.

The condition can be alleviated when applying new throat sheets by increasing the radii of the knuckle and corners as far as practicable. Internal strains are often set up in the sheets when flanging and fitting the plates. Care should be taken to use proper dies and when fitting to see that the plates are properly fitted together before riveting. The expansion of the boiler is often restricted at the throat sheet by using improperly designed or too rigid expansion plates causing the knuckle of the throat sheet to carry excessive strains. The application of sliding blocks, properly lubricated, in place of the rigid expansion plates will relieve strains on the throat sheet. Cracks in the knuckle of the throat sheet can be veed out and welded provided the crack is also covered with a properly designed riveted patch.

Why Was the Smoke-box Damper Eliminated?

Q.—What is the reason for eliminating the damper in the smokebox of the modern locomotives?—M. R. K.

A.—The damper in the smokebox was used for the protection of the superheater units, by stopping the flow of hot gases through the superheater units when the throttle was closed. On the older type superheaters large flues were used which permitted high temperatures around the superheater units when the locomotive was working, the steam in the units protecting them from burning. It was, therefore, necessary to eliminate the gases surrounding the superheater units when the throttle was closed. This was the purpose of the damper. On modern power with Type E superheaters and multiple throttles, the necessity for the damper is eliminated due to the use of smaller diameter superheater flues, resulting in lower gas temperatures at the rear return bend of the units. Also with the use of multiple throttles between the superheater and the steam chest, opportunity is afforded for protecting the units by providing a flow of steam through the units when the throttle is closed, particularly to the blower.

Three Ways to Cure A Leaking Throttle

Q.—We have equipped several Pacific type locomotives with multiple throttles and find that we have trouble with leaky throttles. What causes this condition? Is it due to the expansion of the boiler? Can this condition be remedied by increasing the length of the throttle rod when the engine is hot so that the pilot cam just clears the top collar of the pilot valve?—F. I. R.

A.—A leaking throttle should not be corrected by lengthening the throttle rod when the boiler is hot, for although this change will relieve the pressure of the pilot cam against the top collar of the pilot valve, the exact reverse will be true when the boiler cools down and contracts the same distance it expanded when heated up. The same pressure which existed on the top collar of the pilot valve when the boiler was hot will now be exerted against the bottom collar of the pilot valve when the boiler is cool, setting up strains in the pilot cam and the pull-down collar of the pilot valve as well as upon the latch and teeth of the throttle quadrant.

When the movement of the pilot cam between the top and bottom collars of the pilot valve is not sufficient to take care of the expansion and contraction of the boiler, there are three ways in which the expansion can be taken care of:

First—Make an elongated slot in the throttle-rod jaw of sufficient length to take care of such additional expansion as is not taken care of in the movement of the pilot cam between the top and bottom collars of the pilot valve, the throttle-rod-jaw pin being located in the rear of the slot when the engine is cold and in the front of the slot when the engine is under full boiler pressure.

Second—Apply a compensating lever in the throttle rigging. This compensating lever is located on the side of the boiler midway between the throttle and the throttle lever, the throttle rod being made in two sections. The back section extending from the throttle lever to one end of the compensating lever, the front section extending from the throttle shaft arm to the opposite end of the compensating lever. The length of the compensating lever is made to suit individual conditions. Its advantages are that it eliminates the necessity for a continuous throttle rod with its periodical adjustments at the enginehouse; eliminates all strains to the rigging due to expansion and contraction of the boiler and gives a positive opening and closing of the throttle. With the use of a compensating lever the necessity for providing for expansion in the movement of the pilot cam between the top and bottom collars of the pilot valve is eliminated and the pilot cam is provided with nominal clearance at this point, by increasing the size of the cam. Due to this smaller clearance between the pilot cam and the valve there is less slack between the throttle lever and the throttle valve tending to increase the smoother operation of the throttle in starting and stopping.

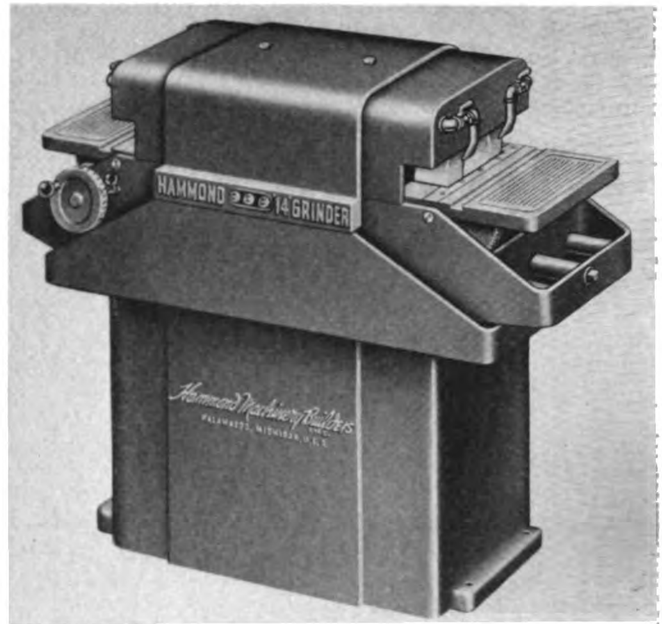
Third—The expansion and contraction of the boiler can also be taken care of by cutting away some of the teeth in the front end of the throttle lever quadrant. This arrangement eliminates the necessity of a stop on the quadrant as the valves in the throttle act as a stop.

The preferred method of compensating for expansion and contraction of the boiler is to apply a compensating lever in the throttle rigging.

Carbide Tool Grinders

Carbide tool grinders intended to give greater speed and accuracy have been developed by the Hammond Machinery Builders, Kalamazoo, Mich. These are known as the "10" and the "14." The "10" combines facilities for straight-wheel peripheral and cup-wheel face grinding; the working tables tilt from zero to 25 deg. with

Carbide tool grinder with adjustable table setting features



Double-duty carbide tool grinder for wet or dry grinding

each degree of tilt measured on scales mounted below the tables. A protractor guide angle operates in a table slot.

The "14" is available for wet or dry grinding and can be had with cup wheels on both sides, or a cup wheel on one side and a straight wheel on the other. The protractor tool gauge furnished as a part of this grinder is universal, sliding in the table slot parallel to the grinding face and having a cross slide for movement toward the wheel.

Both grinders are multi-V-belt-driven, the "10" using a one-horsepower reversing motor with a spindle speed of 2,100 r.p.m.; the "14" having a three-horsepower reversing motor with a spindle speed of 1,350 r.p.m.

Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Straight and Reverse Polarity

Q.—Would you explain what straight polarity and reverse polarity means as applied to welding current?

A.—Until quite recently almost all arc welding was done with the so-called straight polarity. With straight polarity the electrode is the negative side of the current and the work is the positive side. Where bare electrodes are used this is usually the case. Hard surfacing rods and manganese rail welding rods are exceptions. With the introduction of the coated rod or shielded arc process it was discovered that more speed could be developed by reversing the welding current, that is making the electrode positive and the work negative. For alter-

nating current, welding electrodes had to be developed that would weld equally well with either straight or reversed polarity because alternating current is a combination of both. Because of this the shielded arc rod produces welds of equal strength with either straight or reversed polarity.

Fabricating Hopper Car Braces

Q.—Could you suggest an economical method of fabricating, by welding, braces or spreaders for hopper cars?

A.—Hopper car braces or spreaders may be fabricated from 4-in. by 5/16-in. angle and 5/16-in. plate. The correct length of the spreader needed is determined and the angle cut, allowing 5/8 in. for the two 5/16-in. plates

Method of welding hopper car brace

at either end. The end plates may be about 4 in. by 8 in. The angle is set up on the bench and the end plates welded inside and out by the arc method. The plates are drilled and the spreader riveted in place with the apex of the angle on the upper side.

Covering Screw Heads With Solder

Q.—Could some method of welding be used to cover up unsightly screw heads in an express car door?

A.—While welding probably would not be a satisfactory method of covering screw heads in metal doors, the welding torch and solder could be used for this purpose. Clean the head of the countersunk screw and the surrounding area and swab off with cut acid. Then, with a long feather-like flame and a small welding head solder may be flowed onto these screw heads. After a little practice an operator will become so proficient that little subsequent scraping or filing will be necessary.

Emergency Oil Cups

Q.—Often we are unable to obtain suitable small oil cups for valve motion, trailer boxes and many similar places on the locomotive. In an emergency what can be used as a make-shift?

A.—A simple oil cup can be made by the welder in almost any shop. This cup should in no way replace the commercial product but is handy to have in case of an emergency. The cup part is made from 18-gage sheet iron and the threaded part is one half of a 1/4-in. by 3-in. pipe nipple. The sheet is rolled into a cone about 2 in. long with a 1 3/4 in. opening at the top, the bottom of the cone being rolled to fit the outside diameter of the pipe nipple. The cone is pushed onto the nipple. The seam in the cone and the cone itself are welded to the nipple in the same operation. Two short pieces of 1/8 in. welding wire are fastened to the top of the cone to hold the curled hair or waste.

Air Brake Questions and Answers

(AB-8, Empty and Load Equipment Continued)

102—*Q.—How can it be ascertained that the strainer is inserted properly?* A.—All nut threads will be visible.

103—*Q.—What move should follow the application of the strainer?* A.—Remove the shipping cap from the cleaned service portion, applying that portion to the pipe bracket in the same manner as the emergency portion.

104—*Q.—What precaution should be followed before applying the service portion to the bracket?* A.—Make certain that the piston is in release position.

105—*Q.—Why is this necessary?* A.—If the piston happens to project from the bushing, there is a possibility of damage to the ring and groove flange when the portion is tightened to the bracket.

106—*Q.—What precaution must be taken with respect to the shipping caps?* A.—In no case should the service or emergency portion shipping caps be removed until prepared to mount the portions on the pipe bracket.

107—*Q.—What should be done with the portions removed from the car?* A.—They must be sent to the repair shop for cleaning, lubricating and testing in accordance with standard practice.

108—*Q.—When the portions are in place and properly secured, what then should be done?* A.—Connect the release rod. Clean and blow out the dirt chamber in the dirt collector; clean the check valve; clean the gasket or renew it if necessary; then assemble the dirt collector, using a small amount of grease on the bolt threads.

109—*Q.—What part of the equipment should then be given attention?* A.—The brake cylinder. Disconnect the brake cylinder lever from both push rods.

110—*Q.—What should follow this?* A.—Remove the complete piston, rod, spring and non-pressure head assembly from both cylinders, and transport these parts to the shop for reconditioning and testing.

111—*Q.—What precaution should be taken when about to remove the piston and non-pressure head assembly from the empty cylinder?* A.—Examine the piston sleeve protector to determine whether it will hold securely in place.

112—*Q.—What procedure should be followed in dismantling the latch box and notched rod of the load cylinder?* A.—Remove the packing cup and place the assembly in a holding fixture that will clamp the piston in such a manner that the latch box can be unscrewed from the rod after the holding screws are removed and the non-pressure head is depressed against the release spring. The notched rod can then be withdrawn from the hollow piston rod with the latch box.

113—*Q.—What attention should be given the latch box parts?* A.—They must be inspected and cleaned, making certain that the latch operates freely to its locked and unlocked positions.

Reading 55-Ton Hopper Cars

Welded construction used in cars for coal handling—Design involves utilization of large cubic capacity to produce favorable weight-load ratio—Cars were built under spot system using many special tools

Construction of 1,500 welded hopper cars has been completed at the Reading Company's shops at Reading, Pa. The cars, of 55 tons' capacity, have a load carrying size sufficient to permit their use in bituminous coal or the anthracite trade under full axle load as established by A. A. R. limits. One thousand of the cars were placed in service on the Reading, 500 were built for the Wharton & Northern and have been leased to the Central of New Jersey. An additional 2,000 cars of the same type have been ordered on company shops for the Reading.

Welders Trained

Welded car construction was new to the working forces of the railroad, but all men required for welding on track assembly and jig operations were trained from among regular car shop employees. The men took advantage of training classes conducted before the start of the program and a sufficient force of competent welders was developed. As a result of this preliminary training, almost maximum efficiency in welding operations was insured from the start of construction of the cars. Shop welding facilities were increased through the addition of new power wiring and the locating of new outlets along the assembly tracks and at sub-assembly jig locations. Portable single-operator motor-generator sets were used for all welding.

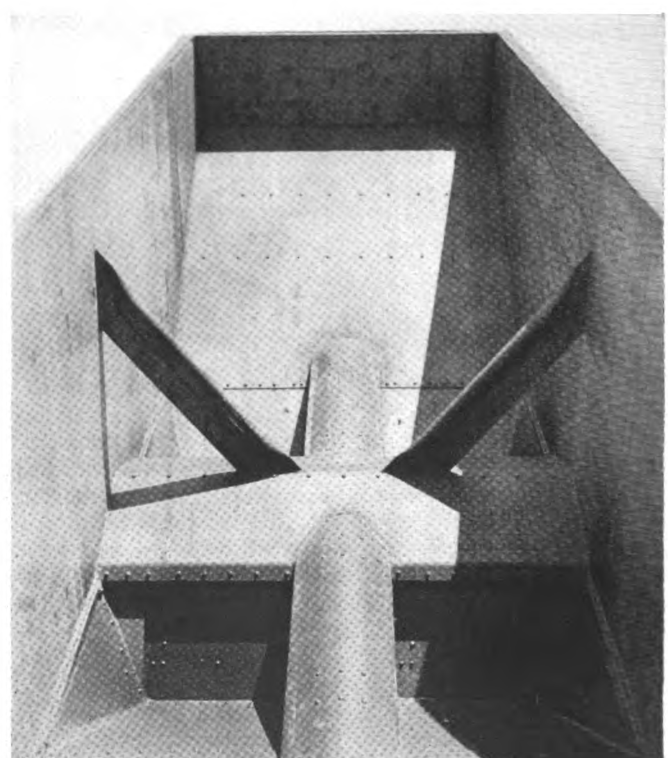
Principal Dimensions of the Reading 55-Ton Hopper Car

Inside length, ft.-in.	31—0
Coupled length, ft.-in.	35—4½
Truck centers, ft.-in.	21—4
Inside width, ft.-in.	9—9¾
Height from rail, ft.-in.	11—0¼
Capacity, level full, cu. ft.	2,028
Capacity, 10-in. heaped load at center, cu. ft.	2,280
Light weight, lb.	42,700
Ratio of pay load to gross load, per cent	74.7

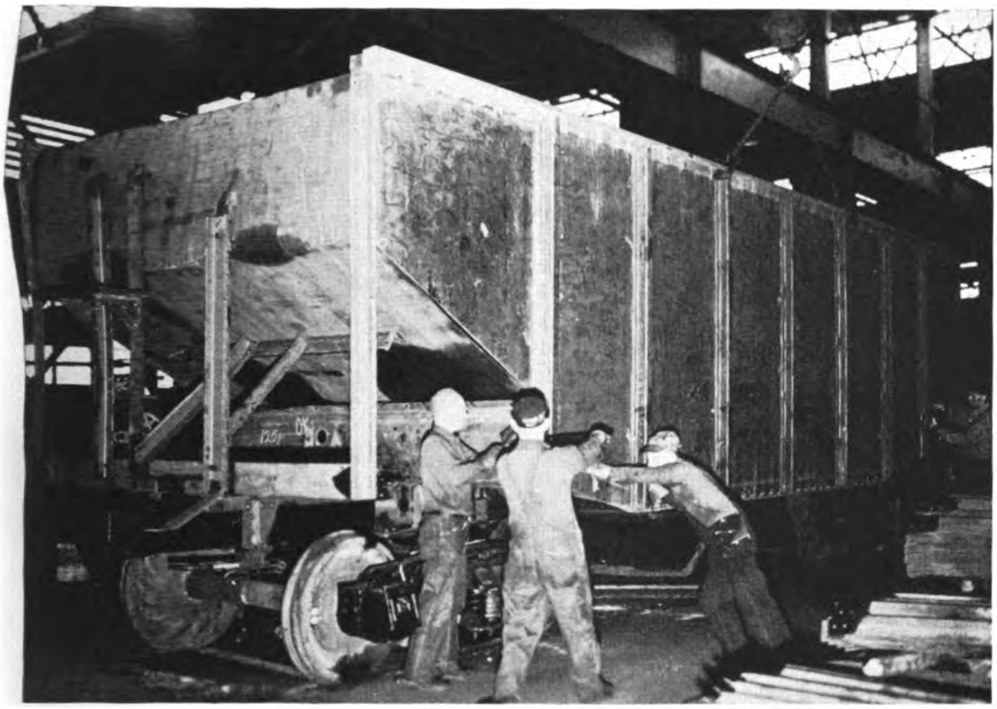
Material Handling

The storage and handling of material was left in the hands of the mechanical department except for a number of small items which were drawn from storehouse stocks as required. The placement of materials and the stocking of shop tracks was carried on as a scheduled part of the construction program and the supervisory forces of the mechanical department had complete control of the flow of needed parts to working locations. Space within the shop was used for the storage of as many of the smaller items as could be accommodated; larger parts were stored outside along lead tracks and were loaded on cars with a locomotive crane to be stocked as required within the shop.

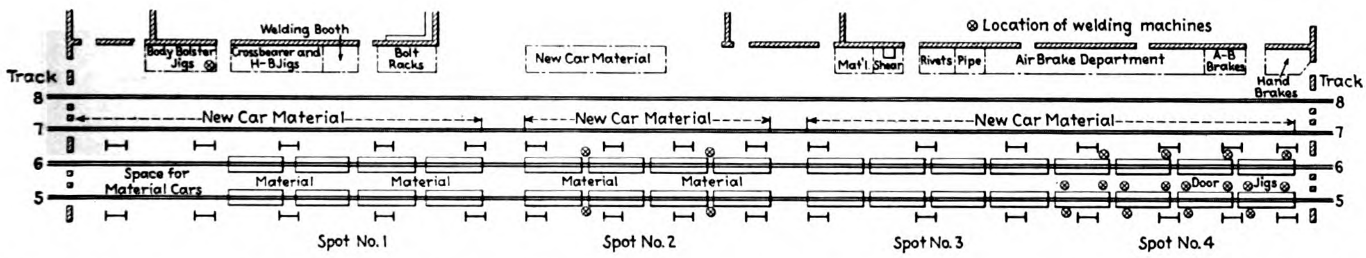
Copper-bearing steel was used in all parts of the car



Continuous end and slope floor sheet and the method of side bracing in Reading hoppers—almost all of the rivets in the car are also visible

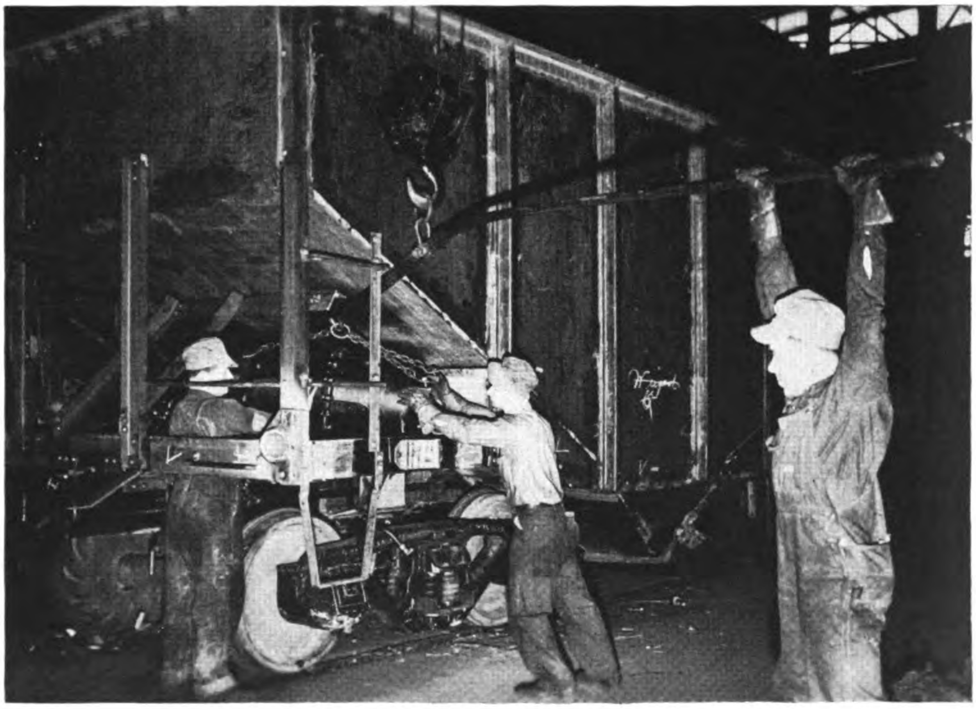


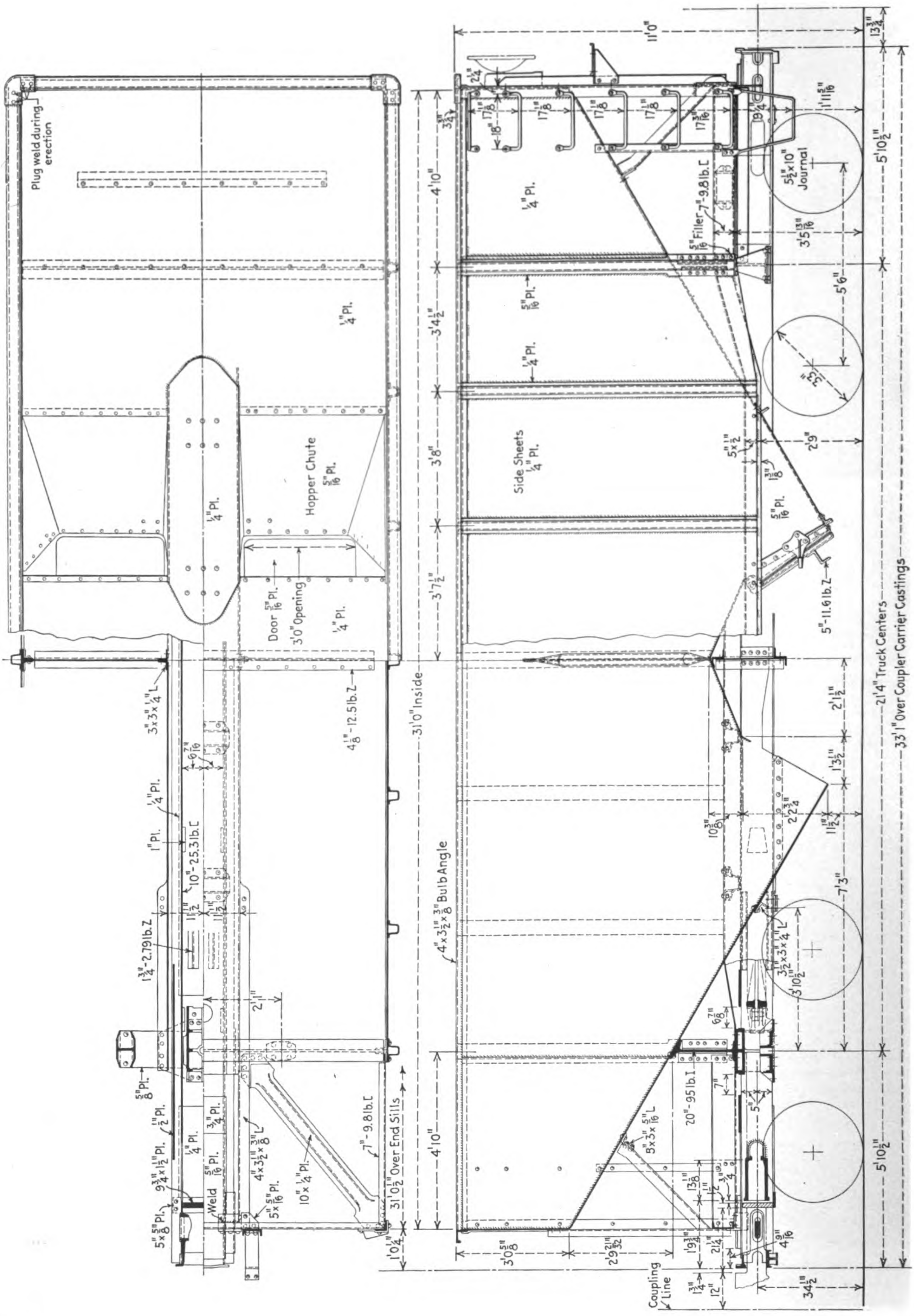
Hanging a complete car side using the safety lifting clamp applied over the side bulb angle — The clamp is locked in position before the lift is made

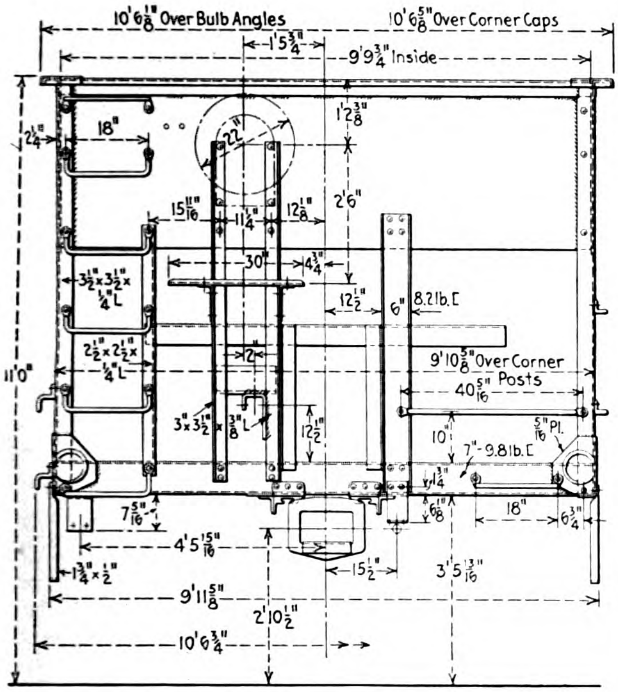


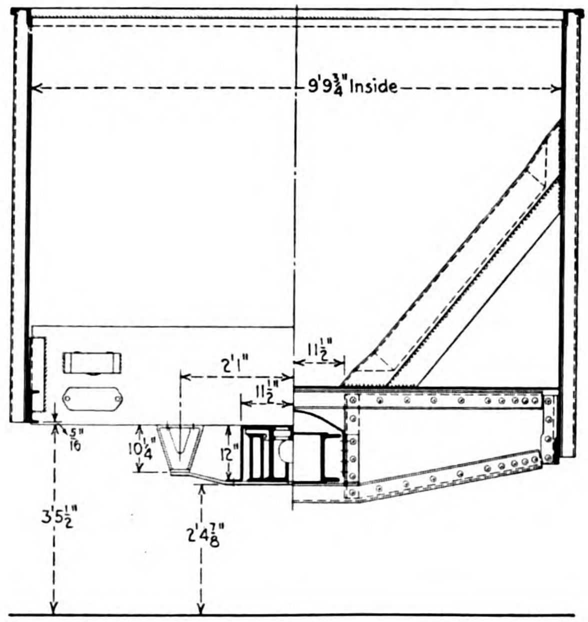
Plan view of portion of Reading car shop used in construction of 55-ton welded hopper cars—Additional material storage space outside the shop was used—Painting was done on open-air tracks after cars were moved from Spot 4

The boom attached to the hook of the overhead crane is used for placing brake reservoirs in restricted working space on welded hopper cars




Plug weld during erection
Hopper Chute 5/16" Pl.
Door 5/16" Pl.
3'0" Opening
1/4" Pl.
4 1/8"-12.5 lb. Z
3'1" Inside
3"x3"x1/4" L
1" Pl.
10"-25.3 lb. [
1 3/4"-2.79 lb. Z
5/8" Pl.
1/2" Pl.
5"x5/8" Pl.
9 3/4"x1 1/2" Pl.
Weld
5/16" Pl.
3/4" Pl.
4"x3 1/2"x3/8" L
5"x5/16" L
10"x1/4" Pl.
7"-9.8 lb. [
31'0 1/2" Over End Sills
4"x3 1/2"x3/8" Bulb Angle
11'0"
Side Sheets 1/4" Pl.
5/16" Filler-7-9.8 lb. [
5 1/2"x10" Journal
5"-11.6 lb. Z
20"-95 lb. I
5"x3"x5/16" L
3 1/2"x3"x1/4" L
Coupling Line
21'4" Truck Centers
33'1" Over Coupler Carrier Castings





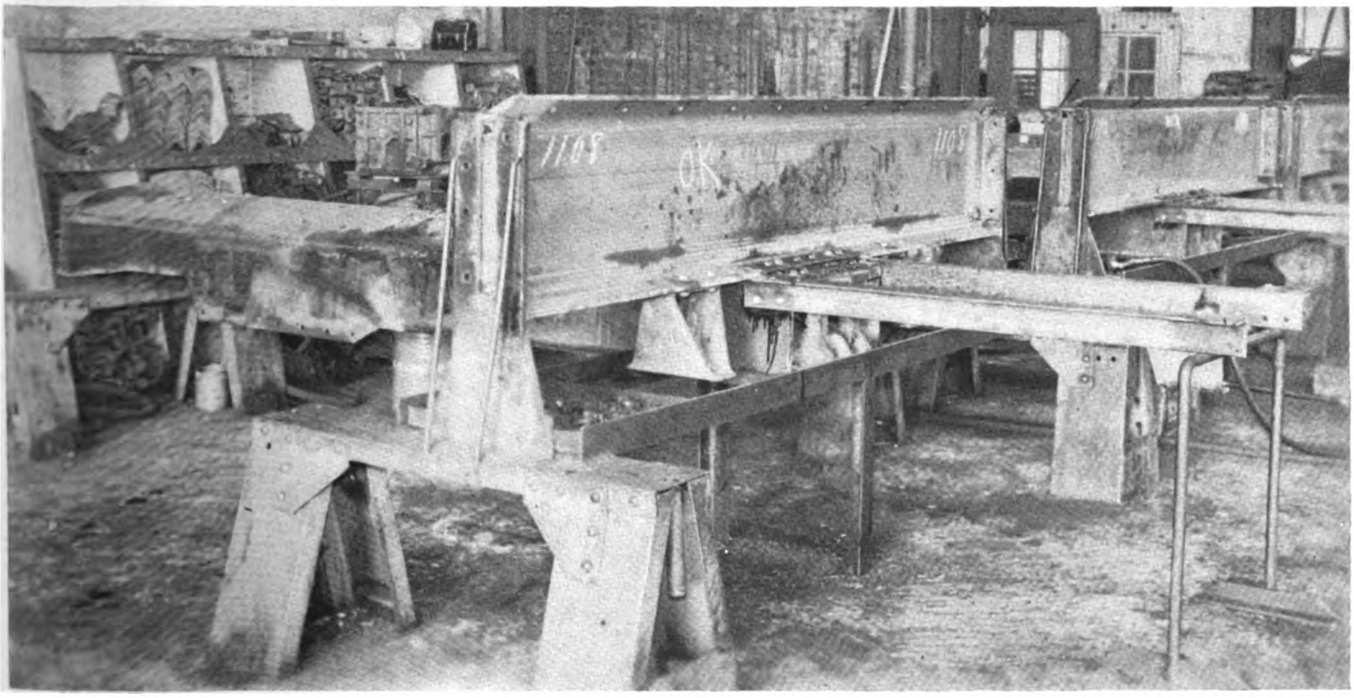
structure that come in contact with the lading. A body service life of from 18 to 20 years is expected and steel thicknesses were calculated to provide approximately equal life in all body parts. Welding is continuous wherever steel meets steel on the inside of the car and full fillet welds were made when possible. To eliminate one joint, where corrosion tends especially to shorten service life, the end and floor of the car are made of a single sheet of steel with a generous radius provided at the bend in the sheet. The body bolster is a 20-in. I-beam with the top flange bent to conform to the angle of the floor sheet. In place of cross bracing from side to side of the car, heavy formed braces are welded from the cross-ridge sheet to the car sides at a vertical angle of 45 deg.

It is anticipated that shopping of these cars for partial repairs, during their ordinary life, will not be required; when general repairs are necessary practically an all new body will be applied.

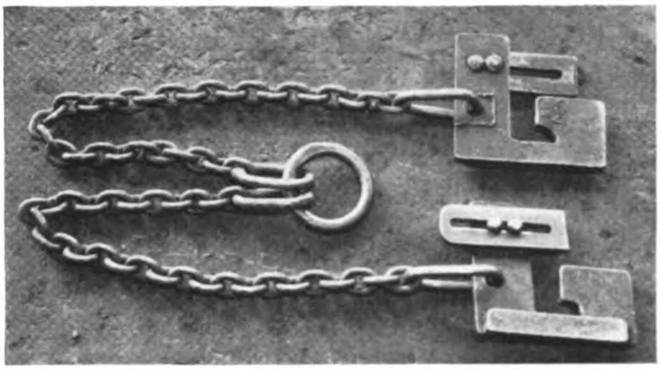
Spot System Set-up

A progressive spot system of construction was used and two production tracks were set up. Eight cars a day were completed and released to service, four cars coming off each track. Sixteen cars were under construction on each track, four cars in each of the four working locations. Full two-shift operation was required with most of the fitting up and riveting being done on the first shift and the welding on the second. Sub-assembly jigs for body bolsters were in use on both shifts, and all other sub-assemblies were built by first-trick forces.

The four working spots on each assembly track were



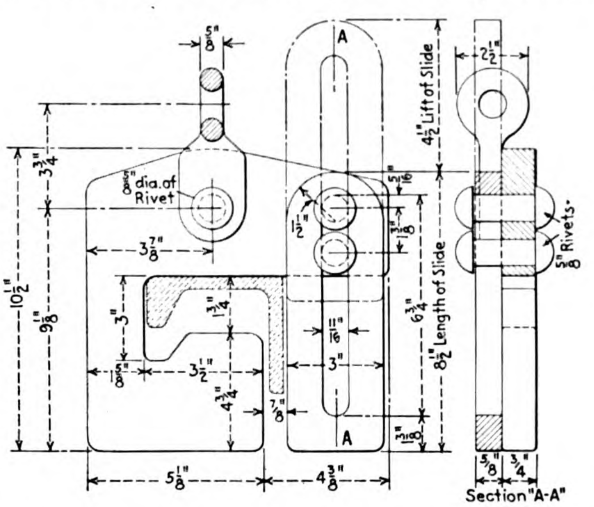
Completed body bolster assembly



Complete hopper-car sides are handled with these safety lifting clamps

filled each day with cars advanced from positions one, two and three and new cars set up in location one. In this spot, center sills were placed on testles until body bolster assemblies, cross-bearer assemblies, cross-ridge sheets, hopper chute and door frames, cross-bearer bottom ties, bolster bottom ties and body center plates had been applied. After the center plates had been riveted, trucks, previously built at another shop location, were placed under the partially completed car.

Location two was used for tack welding and other



Clamp developed at the Reading shops for safe handling of complete hopper car sides

fitting-up operations. Here the end and slope floor sheets, sides, sub side sills, end sills, end posts, end ladders, floor supports, handholds and grab irons were fitted up preparatory to riveting after the next forward movement of the cars.

Cars were moved into location three where all riveting was completed and where AB brakes furnished by the Westinghouse Air Brake Co., Ajax handbrakes, and foundation brake rigging were applied, and coupler-gear springs, coupler follower plates and couplers installed and given a preliminary gauging. All pipe work in connection with the air brakes was prepared beforehand on a quantity production basis, using pipe bending machines designed and built at the Reading Shops. No welding was done in location three.

The fourth shop assembly position was used for all finish-welding operations, completion and testing of air brake work, the application of doors and Wine door-locking mechanisms, the grinding of exterior welds and cleaning of the car body preparatory to painting.

After the completion of shop construction work four days were allowed for the painting of the cars. All painting was done on open-air tracks, which were continuous with those on which the cars were built. On the first day a coat of chromate metal primer was applied, on each of the second and third days a coat of black car paint. On the fourth day the cars were weighed, brush stenciled in accordance with the railroad's standard lettering practice, given a final inspection and released to service.

Sub-Assembly Work

Every opportunity was taken to do sub-assembly work rather than apply individual pieces of material on the cars. Major sub-assemblies were the body bolsters, cross-bearers, end-post hand-brake units, door frames and hopper chutes, door pans and hinges, door spreaders and locking dogs, and trucks. Other cases were numerous where two or more small pieces were riveted together before application.

Special Tools

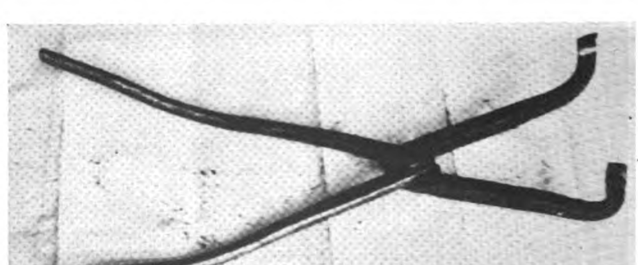
Construction of these cars involved many problems in handling materials and fitting up car parts. It was necessary for the shop supervision to develop a number of new tools, carriers and jacking devices to meet special needs. Loading and unloading of sides was accomplished by the use of a clamping device which could be slipped in place over the side bulb angle and which was locked firmly in place before a lift was made by the crane operator. Safety in the handling of complete side assemblies was insured and the sides could be held in place without danger of slippage until the fit-up gangs had secured them in position on the car. Removal of this lifting clamp required only that the safety slide be raised about 4 inches, after which the clamp was easily slipped off the bulb angle.

Application of air-brake parts was not made until the third working location on the track was reached. By this time the end sills, end posts and ladder stiles, floor sheets and sides, were in place on the car body. Only a small space between the side-ladder stile, the sub side sill and the floor sheet was open for the admission of the AB reservoir to the brackets on which it was mounted. To eliminate manual placement of this comparatively heavy and awkward piece of equipment a boom was built to be hung on the hook of an overhead crane. The crane made the lift and the reservoir was readily steered into position by the workman handling the boom.

Placing body-bolster center-brace rivets was a minor problem finally solved by making the rivet tongs illustrated. With them a firm grip could be obtained on the head of the rivet and the workman placing rivets through the center-brace casting and the flange of the body-bolster I-beam was able to do so easily because of the angle at which the jaws of the pick-up tongs were set.

Cushion-gear Underframes

In building these cars the Reading continued the use of the Duryea cushion underframe. The increased orig-



Special tongs for handling center-brace rivets

inal cost is expected to be more than recovered through the reduction in necessary replacements to conventional type draft gears, increased shock protection to the car structure and lading, and increased availability of equipment because of the reduced number of shoppings for draft-gear repairs and replacements.

Large Cubical Capacity

The principal dimensions of the cars are shown in the accompanying table. No actual weight saving is realized in these cars over the weight of the most numerous class of 55-ton riveted cars now in service on the Reading. The tare weights for the cars just completed averaged 42,700 lb., compared to 42,900 lb. for all-riveted cars of Reading ownership. But, level-load capacity of the new welded cars is 2,028 cu. ft., compared to the 1,880 cu. ft. for the older equipment, an increase in cubical capacity of 7.87 per cent.

With a 10-in. heaped load at center a capacity of 2,280 cu. ft. is obtained, so that cars of this type are available for full tonnage loads in bituminous coal or anthracite service. Reading equipment travels into producing areas for both types of fuel.

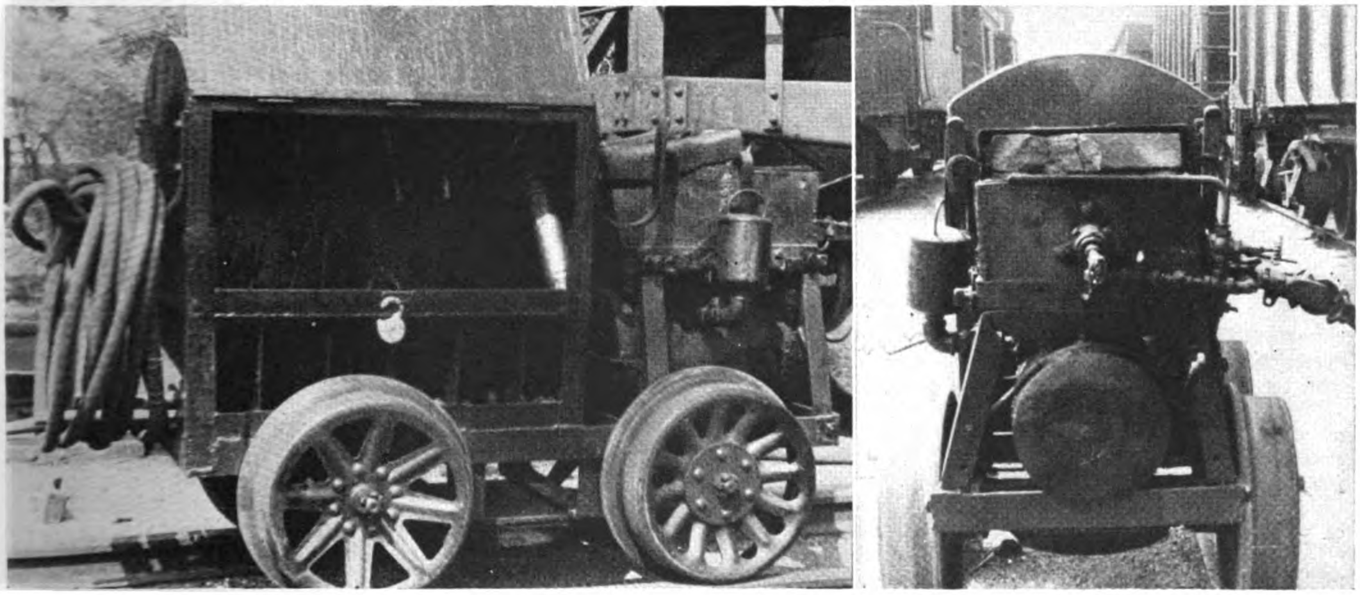
Partial List of Materials and Equipment on the Reading 55-Ton Hopper Cars

Cast-steel truck bolsters and truck sides	Birdsboro Steel Foundry & Machine Co., Reading, Pa.
Cushion-gear underframes	O. C. Duryea Corp., New York.
Uncoupling device	Standard Railway Equipment Manufacturing Co., Chicago.
A. A. R. steel axles	Bethlehem Steel Co., Johnstown, Pa.
Chilled-iron wheels	American Car and Foundry Co., Berwick, Pa.
	Reading Car Wheel Co., Reading, Pa.
Journal bearings	National Bearing Metals Corp., New York.
	Magnus Metal Corp., Chicago.
Roller side bearings	A. Stucki Co., Pittsburgh, Pa.
Journal box dust guards	Consolidated Equipment, Inc., Chicago.
AB brakes	Westinghouse Air Brake Co., Wilmerding, Pa.
Hand brakes	Ajax Hand Brake Co., Chicago.
Brake shoes; brake shoe Lockeys	American Brake Shoe & Foundry Co., New York.
Brake-beam safety guards; brake beams, A. A. R. No. 15	Chicago Railway Equipment Co., Chicago.
Brake levers	Bethlehem Steel Co., Johnstown, Pa.
Brake-hanger retainers	Illinois Railway Equipment Co., Chicago.
Brake pins	Etna Forge & Rivet Co., Etna, Pa.
Brake regulators, type K	Royal Railway Improvements Corp., Wilmington, Del.
Couplers, type E, bottom operated	National Malleable & Steel Castings Co., Cleveland, Ohio.
	Symington-Gould Corp., Rochester, N. Y.
Double coil truck springs	Standard Steel Works, Burnham, Pa.
Truck friction springs	Frost Railway Supply Co., Detroit, Mich.
Spring planks	Parish Pressed Steel Co., Reading, Pa.
Truck-spring plates	Motor Wheel Corp., Lansing, Mich.
Steel castings	Empire Steel Casting Co., Reading, Pa.
	Lebanon Steel Foundry Co., Lebanon, Pa.
	Reading Steel Casting Co., Reading, Pa.
Gray-iron castings	Penn Foundry Co., Reading, Pa.
Hopper door frames, hinges and latches	Wine Railway Appliance Co., Toledo, Ohio.
Bottom rod guards	Chicago Railway Equipment Co., Chicago.
Welding rod	Hollup Corp., Chicago.
Spreader rods	Schaefer Equipment Co., Pittsburgh.
Retainer pipe clamps	T-Z Railway Equipment Co., Chicago.
Retainer valve bracket	Illinois Railway Equipment Co., Chicago.
Draft-key retainers	Champion Rivet Co., Cleveland, Ohio.
Defect-card containers	MacLean-Fogg Lock Nut Co., Chicago.
Draft-key-retainer lock	Illinois Railway Equipment Co., Chicago.
Cotter lock and guard	Central Railway Supply Co., Chicago.
Chromate metal primer	Glidden Co., Reading, Pa.
Black car paint	E. I. DuPont deNemours & Co., Inc., Wilmington, Del.
	Pittsburgh Plate Glass Co., Pittsburgh, Pa.
	Sherwin-Williams Co., Philadelphia, Pa.
Stencil white paint	Glidden Co., Reading, Pa.

Riveting Service Truck

A riveting service truck, developed and used successfully at the Chesapeake & Ohio car repair tracks, Peach Creek, W. Va., is shown in the illustration. It consists of a welded-steel truck body, 60 in. long by 20 in. wide, mounted on flanged wheels which are spaced for use on 24-in. gage tracks. On the front of the truck is mounted a Hauck oil-burning rivet forge, which carries its own supply of fuel oil in a small reservoir under the furnace. The oil is vaporized and burned by air supplied through hose connection from the yard air line. The length of hose required for this air supply is supported on two hooks at the rear of the truck, the body of which is divided into six rivet bins on each side at the bottom. The upper part of the truck body on each side is devoted to locker space for air tools, small hand tools, etc. The locker space is covered by an upward-lifting hinged door which may be closed and padlocked when the tools are not in use.

The main truck frame is made of 2½-in. angles. The remainder of the truck body consists of 1½ in.-angles and thin steel sheets. The principal advantage of this truck in car-repair work is that it brings the rivet forge and all necessary tools to the job with minimum manual efforts and saves time in the riveting job itself, as no time is lost going to and from the shop for necessary tools or rivets.



The riveting service truck used at the C. & O. car-repair yard, Peach Creek, W. Va.

High Spots in

Railway Affairs . . .

Troops Transported In Pullman Cars

D. A. Crawford, president of the Pullman Company, reports that a total of 1,957,200 United States troops were transported in Pullman sleeping cars during 1941. More than 25 per cent, or about 450,000, were transported in the seven weeks following Pearl Harbor. At times as much as one-third the sleeping cars were being used for military service. The problems of assembling the cars on short notice, of handling the movements with the least interference with regular travel, and of redistributing the equipment involved many difficulties. That it was done skillfully and efficiently is indicated by the fact that the public at large hardly realized that the movements were being made.

Protection for Car Windows

Windows of London Transport trolley-buses, trains and railway cars are protected by netting. At first, small circular holes were cut in the netting to give the passenger a better view. Not satisfied, the passengers enlarged the holes by tearing the netting. The company tried cutting larger oblong openings. The passengers still continued to tamper with the nettings and the weekly repair bills were sad to contemplate. Blast tests showed that further enlargement of the holes would defeat the purpose of the netting. Diamond-shaped openings are now being used which give the passenger a wider view but afford adequate protection against blasts. The edges of the holes are treated with a plastic compound which sets hard and discourages the fabric tearers; it also makes a neater appearance.

Railway Guides Deadly

The Railway Gazette of London directs attention to "the need for the utmost co-operation of all sections of the community with the Ministry of Supply (British) in securing the salvage of every possible scrap of waste paper." It suggests that "one source of valuable waste paper may be found among out-of-date A. B. C. Railway Guides which weigh 23 oz. each, and each of which can be used for the production of four gun fuses; 10 of these books will make (wadding for?) eight airplane cannon shells." We immediately had the office boy weigh one of our American Official Railway Guides. It balanced the scale at 3 lb. 5 oz., thus being more than twice as effective for war purposes as the British Guide. For the time being, however, their old guides have the advantage of being much nearer the center of war activities.

Eugene McAuliffe Honored

Eugene McAuliffe was installed as president of the American Institute of Mining and Metallurgical Engineers on February 10. He was one of the prime movers in the organization of the International Railway Fuel Association and served as its first president in 1908-10. He made a splendid record as manager of fuel conservation, division of operation, for the Railroad Administration during and following the First World War. Mr. McAuliffe started in as an apprentice in the Northern Pacific in 1886, but early in his career became identified with the fuel departments of railways and the management of coal mining properties. For many years he has been president of the Union Pacific Coal Company and also of the Washington Union Coal Company. He has made an enviable record in mechanizing coal mining operations and in dealing with the personnel. The University of Missouri bestowed an honorary degree of Doctor of Engineering upon him in 1927.

British Railways Are Looking Ahead

The British railways, now operated under government control, are looking forward to the time when the war will be over and they will again be operated by their owners. A commission has been set up by the Railway Companies Association to consider post-war planning and reconstruction of the railways. It will be headed by Sir Ernest Lemon, vice-president of the London Midland & Scottish. He has had a long and fruitful experience in railway administration and for a while was loaned to Air Ministry as director general of production. Associated with him in the Commission are K. W. C. Grand, assistant general manager of the Great Western Railway; F. J. Wymer, assistant (planning) to the general manager of the Southern Railway; C. K. Bird, assistant divisional general manager (Southern Area) L. N. E. R.; F. A. Pope, manager of the Northern Counties Committee, L. M. S. R.; and T. E. Thomas, general manager (operation) London Passenger Transport Board. The calibre of men on the Commission augurs well for a statesmanlike and effective report.

Local Transport Problems Serious

Director of Defense Transportation Eastman is deeply concerned about local transport shortages that may be caused by increased employment, construction of new industrial plants in outlying areas, stoppage of private automobile production, restriction of civilian purchases of tires, and other factors. As a means of making the greatest use of existing facilities, Mr. Eastman suggested in a statement issued February 17 (1) staggering business, schools, and working hours, (2) improving regulation of street traffic to make possible speedier movement of passenger vehicles, and (3) making more efficient use of private automobiles through doubling up.

Railroads Amaze Ickes

On October 1 last year Harold Ickes bitterly denounced J. J. Pelley, president of the Association of American Railroads, because the latter said that there were about 20,000 idle tank cars that could be used to alleviate the oil shortage on the eastern seaboard. "I suggested to the American railroads," said Mr. Ickes, "as a test of their patriotism and as proof that they repudiate such a disservice as Mr. Pelley has committed them to, that they recall Mr. Pelley and his storm troopers from Washington and render him powerless to commit further mischievous acts." Is Harold red in the face now? Probably not, for he doesn't seem to have much of a conscience. Nevertheless Petroleum Coordinator Ickes read a statement to the oil subcommittee of the House committee on interstate and foreign commerce on February 17 which showed that by the week ended January 31 the amount of oil brought into the eastern area soared to 164,700 barrels daily, an all-time record that greatly exceeded even the peak of last October.

"We were delighted—but we hadn't seen anything yet," continued Mr. Ickes. "During the following week, the oil companies and the railroads set up a record which, I am frank to say, I had doubted was possible. They moved the amazing total of 223,000 barrels a day into the 17 eastern states. This great increase is not so much due to the number of tank cars that are being used as to the greater effiicency of their handling, both by the oil companies and by the railroads. Long hauls have taken the place of short ones; loading and unloading time have been reduced; running time has been greatly speeded up. Gentlemen, I want to take this opportunity to say that I believe that this performance warrants our highest praise, our genuine appreciation."

(Turn to next left-hand page)

In 1941 We Delivered 2,273,825 CHILLED CAR WHEELS To American and Canadian Railroads WE KEEP 'EM ROLLING!

This increase of more than 565,500* wheels over 1940 marks the *4th* successive year of steadily increasing production of new and better Chilled Car Wheels.

**Including only wheels manufactured by members of this Association.*

4 Savings with CHILLED CAR WHEELS

1. **Increased Rail Life**
2. **Reduced Machine Shop Costs**
3. **Lowest Cost Per Mile**
4. **Increased Brake Shoe Life**

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

230 PARK AVENUE, NEW YORK, N. Y.
445 N. SACRAMENTO BLVD., CHICAGO, ILL.

AMCCW

ORGANIZED TO ACHIEVE:
Uniform Specifications
Uniform Inspection
Uniform Product

NEWS

Beyer Granted Leave of Absence from Mediation Board

THE National Mediation Board has announced that Otto S. Beyer has been granted indefinite leave of absence so that he may give full-time service to his position as director of the Division of Transport Personnel, Office of Defense Transportation. When he announced Mr. Beyer's appointment on January 8, ODT Director Joseph B. Eastman said that he anticipated that N. M. B. would arrange to permit the appointee to serve ODT on a full-time basis.

Passenger Cars on Order

CLASS I railroads and the Pullman Company had 513 new passenger cars on order on January 1, according to the Association of American Railroads. This was an increase of 233 compared with the number on order on January 1, 1941, at which time there were 280. Of the total, Class I roads had 316 new passenger cars on order on January 1, this year, compared with 231 on the same date one year ago, and the Pullman Company had 197 on order, compared with 49 on January 1, 1941.

1941 Locomotive Shipments

LAST year's shipments of railroad locomotives totaled 970 as compared with 587 in 1940 and 356 in 1939, according to reports received by the Department of Commerce from builders other than railroad shops. The 1941 total included 182 steam locomotives, 18 electrics, 713 Diesel-electrics, and 57 of other types.

December shipments totaled 96 locomotives as compared with 89 in November and 70 in December, 1940. Unfilled orders at the end of December totaled 1,213 locomotives as compared with 1,022 on November 30, and 354 as of December 31, 1940.

Data supplied by the Car Service Division, Association of American Railroads, on locomotive building in railroad shops show that 24 locomotives (20 steam and four electrics) were thus produced in 1941 as compared with 74 (40 steam, 21 electrics, and 13 "gas or Diesel") in 1940. Railroad shops built six locomotives (four steam and two electrics) in December as compared with none in December, 1940. As of January 1, 1942, railroad shops had unfilled orders for 39 locomotives, including 21 steam and 18 electrics.

Freight-Car and Locomotive Priorities Defined

THE War Production Board has issued interpretations of three preference rating orders—P-21, P-20 and P-8—in order to define more clearly the extent to which priorities assistance is available under them.

Order P-21 covers materials for the repair and rebuilding of steam, electric or Diesel-electric locomotives; P-20 applies to materials going into the construction of locomotives specified in that order; and P-8 governs materials for the construction of railroad, industrial and mine freight cars.

Each order assigns an A-3 preference rating to deliveries of the necessary materials. Each states that the rating may be used to obtain materials entering "directly or indirectly" into the equipment covered.

In order to avoid confusion, the interpretations state that the term "directly or indirectly" does not mean that a producer or supplier can use the rating to get materials for plant expansion, improvement or maintenance. The rating can be used only for materials which will be physically incorporated in the product, or for perishable tools used up in the process of manufacture.

Milwaukee Operates Brake School on Wheels

A CABOOSE in which 13 types of hand and air brakes have been installed is being operated over the Chicago, Milwaukee, St. Paul & Pacific as a classroom for the purpose of instructing freight conductors, brakemen, switchmen, and car inspectors in the safe and proper operation of brakes. The idea for the school was conceived by L. J. Benson, assistant to the chief operating officer, as a means of reducing accidents resulting from improper hand-brake operation and to perfect instruction in the operation of the many types of brakes in service on the railroads, which instruction heretofore had been given to new men by older employees. It is estimated that proper instruction in the operation of brakes will reduce substantially the number of deaths and injuries to employees and thereby save man-hours of work during the war.

Instruction is being given in setting and releasing several types of hand brakes and in the operating principle of K and AB air brakes. Another feature of the car is a section devoted to the display of six types of fire extinguishers which are used on rolling stock and in offices and shops.

The car was fitted in the company's shops at Milwaukee, Wis. It is operating over the system, stopping from one to several days at various points to instruct switchmen and trainmen.

Barriger Joins Eastman Staff

JOHN W. BARRIGER, III, has been appointed by Director Eastman of the Office of Defense Transportation to the position of associate director of ODT's Division of Railway Transport which is headed by V. V. Boatner. Also, Mr. Eastman has announced the creation of a Division of Coastwise and Intercoastal Transport, headed by Ernst Holzborn of New Orleans, La., executive vice-president of the Atlantic Coastwise and Inland Water Carriers Association, Inc., and former assistant director of the Interstate Commerce Commission's Bureau of Water Carriers.

Instruction in proper brake operation is given in a caboose car which has been fitted with several types of brakes

(*Turn to next left-hand page*)

Industry Committee on Solid Fuels

SOLID Fuels Coordinator Harold I. Ickes has announced the appointment of members of an industry committee on solid fuels. The function of the committee, according to Mr. Ickes, will be to advise on the coordination of the Nation's fuel supply to meet war-time needs.

Representing railroad transportation will be J. J. Pelley, president of the Association of American Railroads, and W. C. Kendall, chairman of the Car Service Division of the A. A. R. Transportation other than railroad will be represented by Lachlan Macleay, president of the Mississippi Valley Association.

History of Koppers Subsidiary Includes Locomotive-Building

A SUBSIDIARY of Koppers Company was once in the business of building standard steam locomotives. This and other interesting facts about the Bartlett Hayward division of Koppers Company are presented in a history of the 103-year existence of the Division and predecessor companies entitled "Iron Men and Their Dogs," by F. C. Latrobe, recently issued by the Division. The Bartlett Hayward division, which now manufacture coal gas plants, in its early history as a separate company was in the general foundry business, manufacturing stoves, cast-iron building fronts, etc. In 1863 the then Hayward, Bartlett & Co. took over the Winans Locomotive Works at Baltimore, Md., which it operated until 1867 as the Baltimore Locomotive Works. During its tenure of the works, Hayward Bartlett & Co. built or rebuilt 25 steam locomotives in addition to completing three Winans locomotives already under construction.

Budd Receives Navy Pennant for Production

THE Navy "E" pennant, since 1906 the traditional award of merit in the United States Navy, was awarded to the Edward G. Budd Manufacturing Company on February 4 in the presence of Naval, company and civic officials and a large number of employees of the plant. Chief feature of the program was the presentation of a pin bearing the Bureau of Ordnance insignia and the Navy "E" to Gerard Livezey, a foreman, representative of the 10,000 Budd employees, some 4,000 of whom attended the celebration.

Award of the "E" is based upon the status of the company's production as compared to contract schedules, the amount of ingenuity shown in overcoming obstacles, the degree of corporate self-reliance, and willingness by the manufacturing company to tackle difficult tasks and give to the Navy genuine co-operation.

The Budd Company today is busy with defense work. Material for every branch of the service is rolling from the company's production lines, and some 75 per cent of the company's output is now for defense. An early conversion to 100 per cent defense work is anticipated. Among the products Budd is producing for the Navy are metal components and other devices for the Bureau of Ordnance; stacks, uptakes, doors, hatches, masts and other parts for naval vessels; and stainless steel assemblies and parts for naval aircraft.

Timken Eliminates Demurrage

THE Timken Roller Bearing Company, Canton, Ohio, is currently making a practice of holding no car over 48 hr. "It is a very easy thing to do," according to W. C. Sanders, general manager, Railway division. "We simply make the head of every department in our various plants see to it that no car, either incoming or outgoing, is retained over 48 hr. [after which demurrage begins]. We have explained to our department heads that it is desirable to load and unload the cars in less than 24 hr. or, if possible, in 1 hr., because the cars are badly needed elsewhere.

"Furthermore, freight car storage is expensive. The average box car contains about 360 sq. ft. of floor space and from 3000 to 3500 cu. ft. of capacity. At $5.50 demurrage per day, this amounts to 46 cents per sq. ft. per month. The average rental of space in common storage warehouses costs about 3 cents per sq. ft. per month. This includes a sprinkler system and heat."

A. C. L. Cars Carry Revenue Freight During Delivery

NEW freight cars ordered by the Atlantic Coast Line will be placed in service as soon as they are completed and before they are delivered to the railroad. There are no freight car builders located on A. C. L. rails and, ordinarily, when new freight car equipment is ordered, the new cars must be hauled empty over other lines. In view of the present emergency, the railroad has agreed to have its cars loaded immediately upon leaving the builders' plants, thus immediately contributing the cars to the national freight-car service pool, even though the result is that in many instances the new cars are considerably delayed in actually reaching their owner's rails. The plan was disclosed by C. McD. Davis, executive vice-president, in announcing the purchase of 2,000 freight cars, the orders for which were announced in the February issue.

Buckles in Steel Sheets Not Wider Than 48 In.

ACCORDING to a circular letter, issued February 17, by the secretary of the A. A. R. Mechanical Division, Spec. M-117-37 for carbon steel sheets and thin plates, under Sect. IV, permissible variations in weight, thickness and size, Par. 17, Table VII, limits buckles in sheets not wider than 48 in. to a maximum height of ½ in. The steel companies, under present conditions, will not agree to furnish these sheets to other than the manufacturers' standard practice, which allows ¾-in. buckles for this width of sheet.

This has caused considerable controversy and correspondence between car builders, manufacturers of steel and railroads in connecton with specifications for new freight cars.

This matter has been considered by the Committee on Car Construction and the Committee on Specifications for Materials, which are unanimously of the opinion that Spec. M-117-37 should not be modified to permit buckles higher than ½ in. in these sheets, because the specification is not made primarily for the steel industry but to establish limits which have been found desirable in car construction.

It is recommended, however, that individual purchasers relax the buckle limit in the specifications during the war period, because it devolves on all concerned to avoid any arbitrary position which might reflect on the total steel output of the mills and the total number of freight cars which may be built.

Maintenance of Automobile Loading Devices

ATTENTION has been called to an increase in damage claims on automobile shipments due to failure of hold-down chains in device cars. This is of particular importance in view of the present large shipments of army trucks and other heavy automotive equipment.

In the interest of safety and to avoid damage to lading in transit, special attention should be given to hold-down chains during inspection of device cars prior to loading to make certain that all chains and their attachments are in proper condition for use.

Where links or other parts are found worn to the extent of reducing the original cross-sectional area by 25 per cent, or otherwise defective, chains should be repaired or replaced.

The use of repair links should be discontinued, according to a circular letter, issued under date of February 16, by the secretary of the A. A. R., Mech. Div.

Equipment Purchasing and Modernization Programs

Chesapeake & Ohio.—The C. & O. has asked the Interstate Commerce Commission for authority to assume liability for $5,150,000 of equipment trust certificates, bearing interest at not more than 2½ per cent and maturing in 10 equal annual installments of $515,000 on February 15 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $6,544,784, and consisting of 10 class H-8-A, type 2-6-6-6 freight locomotives with 25,000 gallon tenders; 15 class C-16-A, type 0-8-0 switching locomotives with 8,000 gallon tenders, and 1,000 50-ton, all-steel hopper cars.

Chicago & Eastern Illinois.—The C. & E. I. has asked the Interstate Commerce Commission to approve a plan whereby it would issue and sell to the Reconstruction Finance Corporation $1,200,000 of 2½ per cent equipment trust certificates maturing in 30 equal semi-annual installments of $40,000 beginning May 1, 1942, and continuing each May 1 and November 1, to and including May 1, 1957. The proceeds of the issue will be used as part of the purchase price of new equipment costing a total of $1,500,000 and consisting of 500 50-ton, 40 ft. 6 in. steel underframe box cars.

(Continued on next left-hand page)

Chicago & North Western.—The North Western has applied to the Interstate Commerce Commission for authority to assume liability for $3,750,000 of equipment trust certificates. The proceeds would be used to finance 75 per cent of a $5,079,750 expenditure for the following equipment: 500 50-ton, steel-sheathed, wood-lined box cars; 1,000 70-ton steel gondola cars with wood floors; and 250 50-ton steel flat cars with wood floors. The certificates will bear interest at a rate to be determined from competitive bids; they will be dated March 15, 1942, and will mature in 10 equal annual installments on March 15 of each year from 1943 to 1952, inclusive.

Requests for bids for equipment trust certificates aggregating $3,750,000 have also been sent out. The certificates are to cover 75 per cent of the cost of 1,750 units of freight equipment recently ordered, including 1,000 70-ton gondola cars, 500 50-ton box cars and 250 50-ton flat cars.

Colorado & Southern.—The Colorado & Southern has awarded a contract to Walter H. Harris, Denver, Colo., for the construction of a one-story addition to the enginehouse at Denver, which will be used as a machine shop.

Missouri Pacific.—The district court has approved a Missouri Pacific budget for $10,653,985 for 1942. The largest item in the budget is for labor and materials for the laying of 220 miles of new rails and the relaying of 229 miles of secondary track. Among other improvements included in the budget are the conversion of passenger cars, and repairs to locomotives and freight cars.

Reading.—The Reading has been authorized by its board of directors to construct 1,000 31-ft. steel hopper coal cars of 55 tons' capacity in the company's own shops as soon as the material is available, at a total expenditure of approximately $2,500,000. The board also authorized the conversion of 50 70-ton hopper coal cars into 50 covered cement hopper cars for the handling of cement, at a cost of approximately $130,000.

St. Louis-San Francisco.—The Frisco has asked the district court for permission to purchase eight 1,000 hp. and two 600 hp. Diesel-electric switching locomotives.

St. Louis Southwestern.—The St. L. S. W. is reported to be contemplating building five steam locomotives of the 4-8-4 type.

Materials Lack Still Big Worry

THE securing of materials and equipment, the creation of storage and warehouse facilities in terminal areas, and the transportation of workers to and from work plants were cited as problems 1, 2 and 3 of transportation and the Office of Defense Transportation by Joseph B. Eastman, director of that office, at a luncheon of the Traffic Club of Chicago on February 5. The vital thing in transportation, he said, is to prevent anything that will cripple the war effort which is dependent upon it. The O. D. T., he continued, is not a second United States Railroad Administration. It was created not to drive the carriers but to lend them the help and the authority of the government for assuring the maximum utilization of transportation for the successful prosecution of the war. The Office will keep watch so as to be able to make proper recommendations to the President if necessary.

Price Ceilings on Specialties

PRICE ceilings for so-called railroad specialties—i. e., side frames, bolsters, couplers, and yokes—are fixed at levels prevailing October 1, 1941, by Amendment No. 1 to Steel Castings Price Schedule No. 41 Leon Henderson, administrator, Of[illegible] Price Administration, has an[illegible]ced. The new prices are listed in the amendment, effective February 3.

A ceiling based on July 15, 1941, prices originally was set for steel castings, including railroad specialties. This ceiling permitted the steel castings producers to keep a price increase which had been made to July 15, 1941, but eliminated a corresponding increase made by the railroad specialty producers after July 15, 1941. The new amendment permits the corresponding increase for the railroad specialties.

A change also was announced in steel castings. This is applicable in the case of a producer who receives an order for a particular item which he was not making on or prior to July 15, and therefore, one for which he had not filed a price. In such case, where on and after February 5, 1942, a producer makes a steel casting for which he has not previously filed a price with OPA, then such casting must be sold at a price not higher than that listed in the Steel Founders Society's Comprehensive Report for the corresponding casting. As an alternative, or in a case where the particular casting is not listed in the Comprehensive Report, the producer must obtain approval of the proposed selling price from OPA. If OPA does not act upon any such request for approval of a price within six days, the request price is deemed to be approved automatically, it was stated.

Trade practice for steel castings and railroad specialty producers, the OPA announcement said, has been to quote a firm price for a limited period. Permission is granted such producers in the new amendment to quote prices not in excess of OPA levels in effect at time of delivery, where such delivery is not to take place until six months or more after the contract of sale is entered into.

New Plan for Steel Plates

A COMPREHENSIVE plan for control over production, consumption and allocation of steel plates was outlined on February 16, at a meeting of plate producers by C. E. Adams, chief of the iron and steel branch of the division of materials, War Production Board.

The stated purpose of the new set-up is to insure fulfillment of all military re-

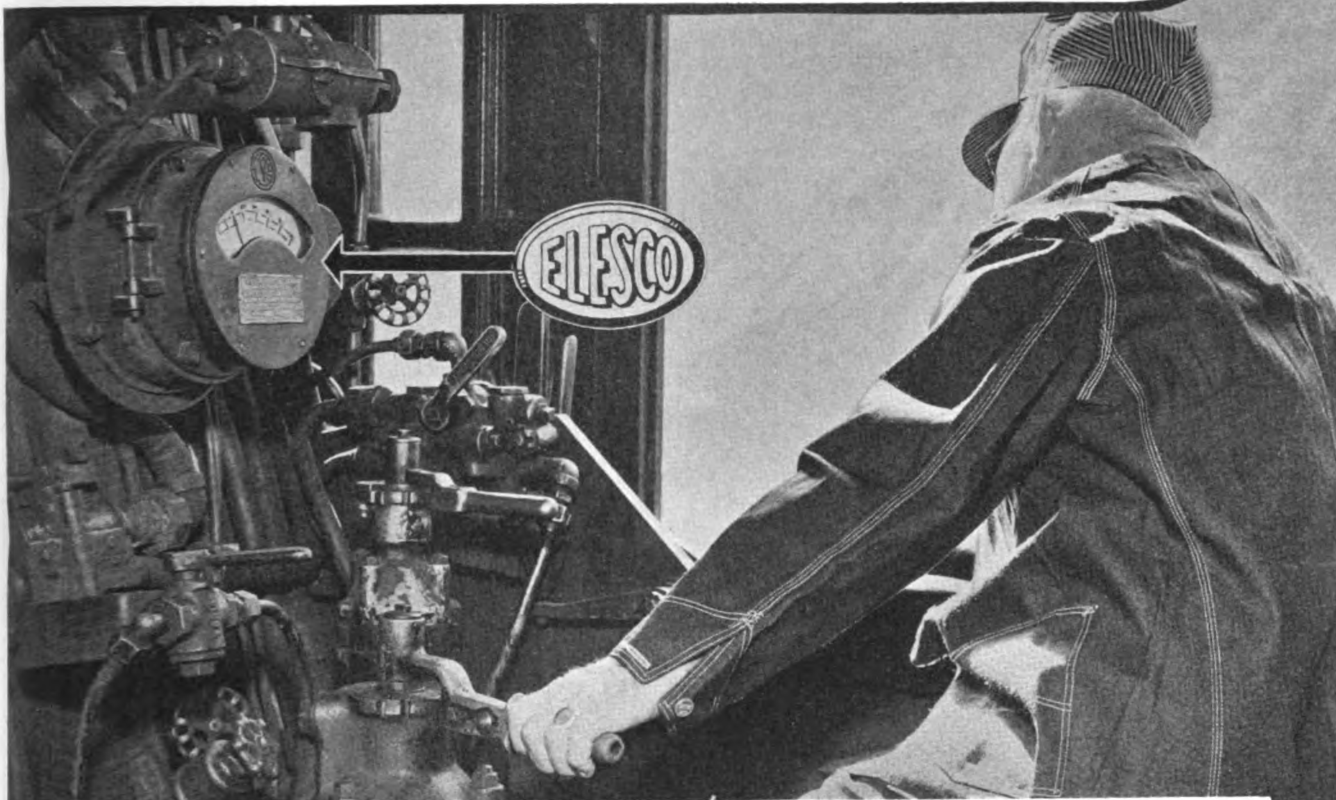
(Continued on next left-hand page)

Orders and Inquiries for New Equipment Placed Since the Closing of the February Issue

Road	No. of Locos.	Types of Locos.	Builder
		LOCOMOTIVE ORDERS	
Bethlehem Steel Co.	1	25-ton Diesel-elec.	General Electric Co.
Chicago, Rock Island & Pacific	5	4,050-hp. Diesel-elec. frt.	Electro-Motive Corp.
	8	600-hp. Diesel-elec.	Electro-Motive Corp.
	4	1,000-hp. Diesel-elec.	American Loco. Co.
Lake Champlain & Moriah	1	1,000-hp. Diesel-elec.	Electro-Motive Corp.
Nashville, Chattanooga & St. Louis	5	1,000-hp. Diesel	American Loco. Co.
New York Central[1]	25	4-8-2	Lima Loco. Wks.
	2	4,000-hp. Diesel-elec.	Electro-Motive Corp.
	10	600-hp. Diesel-elec.	Electro-Motive Corp.
	17	660-hp. Diesel-elec.	American Loco. Co.
	3	660-hp. Diesel-elec.	Baldwin Loco. Wks.
Remington Arms Company	1	45-ton Diesel-elec.	General Electric Co.
St. Louis Southwestern	3	1,000-hp. Diesel-elec.	Baldwin Loco. Wks.
Wabash	2	1,000-hp. Diesel-elec.	American Loco. Co.
		LOCOMOTIVE INQUIRIES	
Boston & Maine	5	4-8-2	......
New York, Chicago & St. Louis	15	Steam	......
Northern Pacific	10	4-8-4	......
		FREIGHT CAR ORDERS	
Baltimore & Ohio	1,000[2]	50-ton hopper	Bethlehem Steel Co.
	1,000[2]	50-ton box	Gen. Amer. Trans. Corp.
Chicago & North Western	500	70-ton gondola	Bethlehem Steel Co.
	500	70-ton gondola	Gen. Amer. Trans. Corp.
	502	50-ton box	American Car & Fdry. Co.
	250	50-ton flat	Pull-Std. Car Mfg. Co.
Central of Georgia	100	50-ton box	American Car & Fdry. Co.
Delaware & Hudson	12	50-ton box	American Car & Fdry. Co.
Detroit, Toledo & Ironton	50	70-ton flat	Greenville Steel Car Co.
	70	70-ton gondolas	Greenville Steel Car Co.
Nashville, Chattanooga & St. Louis	50	50-ton covered hopper	American Car & Fdry. Co.
New York Central[1]	1,100	55-ton box	Despatch Shops, Inc.
	600	70-ton gondola	Despatch Shops, Inc.
	300	70-ton flat	Despatch Shops, Inc.
	500	55-ton hopper	Despatch Shops, Inc.
New York, Chicago & St. Louis	25	Caboose	Magor Car Corp.
Norfolk & Western	1,000	50-ton box	Ralston Steel Car Co.
Pere Marquette	250	70-ton flat	Greenville Steel Car Co.
St. Louis-San Francisco	...	Steel underframes, assembled car sides and miscel. forgings for 70 50-ton box	American Car & Fdry. Co.
Southern	2,500[3]	50-ton hopper coal	Pull.-Std. Car Mfg. Co.
		FREIGHT-CAR INQUIRIES	
Chicago, Indianapolis & Louisville	500	Freight	......
Nashville, Chattanooga & St. Louis	450	Freight	......
Union Pacific	1,000	50-ton ballast	......
	1,000	50-ton gondola	......

[1] Locomotive deliveries expected to begin in August of this year. Orders for new locomotives and cars to cost approximately $14,000,000.
[2] Cost of 2,000 freight cars, $6,000,000.
[3] To cost approximately $6,500,000.

"JUST NOTICE THAT *Pyrometer*"—



"There was a discussion on *pyrometers* a little while ago and I will show you that they are *a mighty fine thing on a locomotive.* I had occasion to call an engineer's attention to the use of a pyrometer some time ago. I got on his engine and the pistons looked like a new shiny dollar. I said 'It appears that your engine is not lubricating very well.' 'No,' he said, 'she is not.' Well, we started out and I thought I would just see what would happen . . . the engineer made no attempt to blow off the boiler — the *pyrometer temperature showed about 500 degrees.* After we went a ways and I saw nobody was going to make any effort to blow out the boiler, I said, '*Just notice that pyrometer. You should have at least 640 deg. or 650 deg. temperature.* Let's blow off the boiler.' So we got the water down to where it should be carried, and at the next stop the engine showed some signs of lubrication, and at the completion of the run . . . the pistons were swimming in oil . . .

"In regard to the pyrometer, after we blew out the boiler regularly, the temperature gradually went up and *we had about 660 degrees . . .*"

—FROM PROCEEDINGS OF RAILWAY FUEL & TRAVELING ENGINEERS' ASSOCIATION

BE SURE YOUR LOCOMOTIVES ARE EQUIPPED WITH ELESCO PYROMETERS

A-1483

SUPERHEATERS • FEEDWATER HEATERS
AMERICAN THROTTLES • STEAM DRYERS
EXHAUST STEAM INJECTORS • PYROMETERS

THE SUPERHEATER COMPANY

Representative of AMERICAN THROTTLE COMPANY, INC.
60 East 42nd Street • NEW YORK
122 S. Michigan Avenue • CHICAGO
• • •
Montreal, Canada
THE SUPERHEATER COMPANY, LTD.

quirements, particularly those of the Navy and the Maritime Commission for ship plates. The ship program, plus necessary requirements for the Army, the construction of new war plants, the railroads and other heavy industry, leave no leeway in plate production, it was said. The WPB announcement also declared that the delivery of ship plate has lagged at times in recent months despite an increase in the overall plate production.

Under the new regulations, two forms must be filed monthly by consumers. Form PD-298 lists in detail requirements for the following month and the uses to which plates are to be put. Two copies are to be filed with the producer and one with the War Production Board, at least a month in advance. Form PD-299 must be filed by the seventh of the month and lists consumption, inventories and receipts for the month and estimated requirements for the two months following. Also, producers will report to the WPB daily, weekly, and monthly by wire as to shipments of plates, and monthly on schedules for the month following.

Only orders for plates carrying a preference rating of A-10 or higher, or those specifically allocated by the director of industry operations, may be requested, scheduled or delivered.

The announcement also notes that steel plate shipments in January were the highest in the nation's history, due largely to the conversion of strip and sheet mills to plate production. Shipments totaled 754,522 tons, as compared to 635,812 for December, 1941, the previous record.

Meanwhile, supplementary order M-1-f, which brings into one order complete allocation control over aluminum, has been issued by J. S. Knowlson, director of industry operations. It replaces orders M-1 and M-1-a. The order, according to the WPB announcement, leaves the allocation control over aluminum in substantially the form in which it now is being administered.

Supply Trade Notes

THE PACIFIC RAILWAY EQUIPMENT COMPANY, Los Angeles, Calif., has moved its offices and plant to 960 E. Sixty-first street in that city.

◆

JAMES B. HAYDEN, sales manager of the Industrial Brownhoist Corporation, Bay City, Mich., has been elected vice-president in charge of sales.

◆

THE STANDARD CAR TRUCK COMPANY, Chicago, has opened an office at 455 Paul Brown building, St. Louis, Mo., with J. C. Barber in charge.

◆

J. D. MCKNIGHT has been named assistant district manager of the Detroit, Mich., office of the Allegheny Ludlum Steel Corporation. Mr. McKnight joined the Detroit staff of Allegheny Ludlum in 1936.

◆

FRANK W. LEWIS, formerly chief mechanical engineer of the Bettendorf Company, has become associated with the Allied Railway Equipment Company of Chicago, as vice-president in charge of engineering.

◆

JAMES H. SHAFFER, formerly sales and service engineer with the Ajax Hand Brake Company, has joined the Schaefer Equipment Company as a special representative with headquarters at 2710 Koppers building, Pittsburgh, Pa.

◆

ALLIS-CHALMERS MANUFACTURING COMPANY.—*Max W. Babb*, president of the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has been elected chairman of the board, a position which has been vacant since the death of Otto H. Falk on May 21, 1940. *W. C. Buchanan*, a director and member of the executive committee, has been elected president.

◆

WHITING CORPORATION.—*Howard D. Grant* has been elected executive vice-president and chairman of the executive committee of Whiting Corporation, Harvey, Ill., and *Stevens H. Hammond*, vice-president, has been elected a member of the executive committee. Mr. Grant takes over the duties of *Gen. Thomas S. Hammond*, president, who has resigned as president and a director of the company to devote his full time to the Chicago Ordnance district staff as chairman of the executive committee. Mr. Grant also succeeds *C. Q. Wright, Jr.*, who has resigned to become naval adviser in the Contract Distribution Branch of the War Production Board in Chicago. Mr. Stevens H. Hammond will supervise all of the company's sales activities.

◆

ARTHUR T. COX, JR., has been elected vice-president of The Lincoln Electric Railway Sales Company, with headquarters at Chicago, Ill. Mr. Cox, who was born on May 5, 1911, at Indianapolis, Ind., studied engineering at Cornell and Purdue Universities and was graduated from the

Arthur T. Cox

latter in 1933. Before his appointment as vice-president of The Lincoln Electric Railway Sales Company at Chicago, Mr. Cox was sales manager of the Bettendorf Company, Bettendorf, Iowa. Prior to that he had been a district sales manager in the Industrial Sales Division of The Lincoln Electric Company, by whom he had been employed from September 16, 1936, until May 8, 1939. In his work as vice-president Mr. Cox will be in charge of welder machine and electrode sales as well as engineering service on all railroads in Chicago and territory west of Chicago.

◆

GEORGE G. PREST, who was associated for a number of years with the late George H. Goodell, railway equipment manufacturers' agent at St. Paul, Minn., has been appointed representative for the National Lock Washer Company, Newark, N. J., in Minneapolis and St. Paul.

◆

MCKENNA METALS CO.—The McKenna Metals Co., Latrobe, Pa., announces the appointment of two new sales representatives in the Eastern district, to operate under *J. A. Deakin, Sr.*, eastern sales manager, 50 Church street, New York. *R. S. Hudgins*, one of the new Kennametal representatives, will have headquarters at 965 Farmington avenue, West Hartford, Conn., and *Charles E. Washburn* will be located at 258 Park Square building, Boston, Mass.

◆

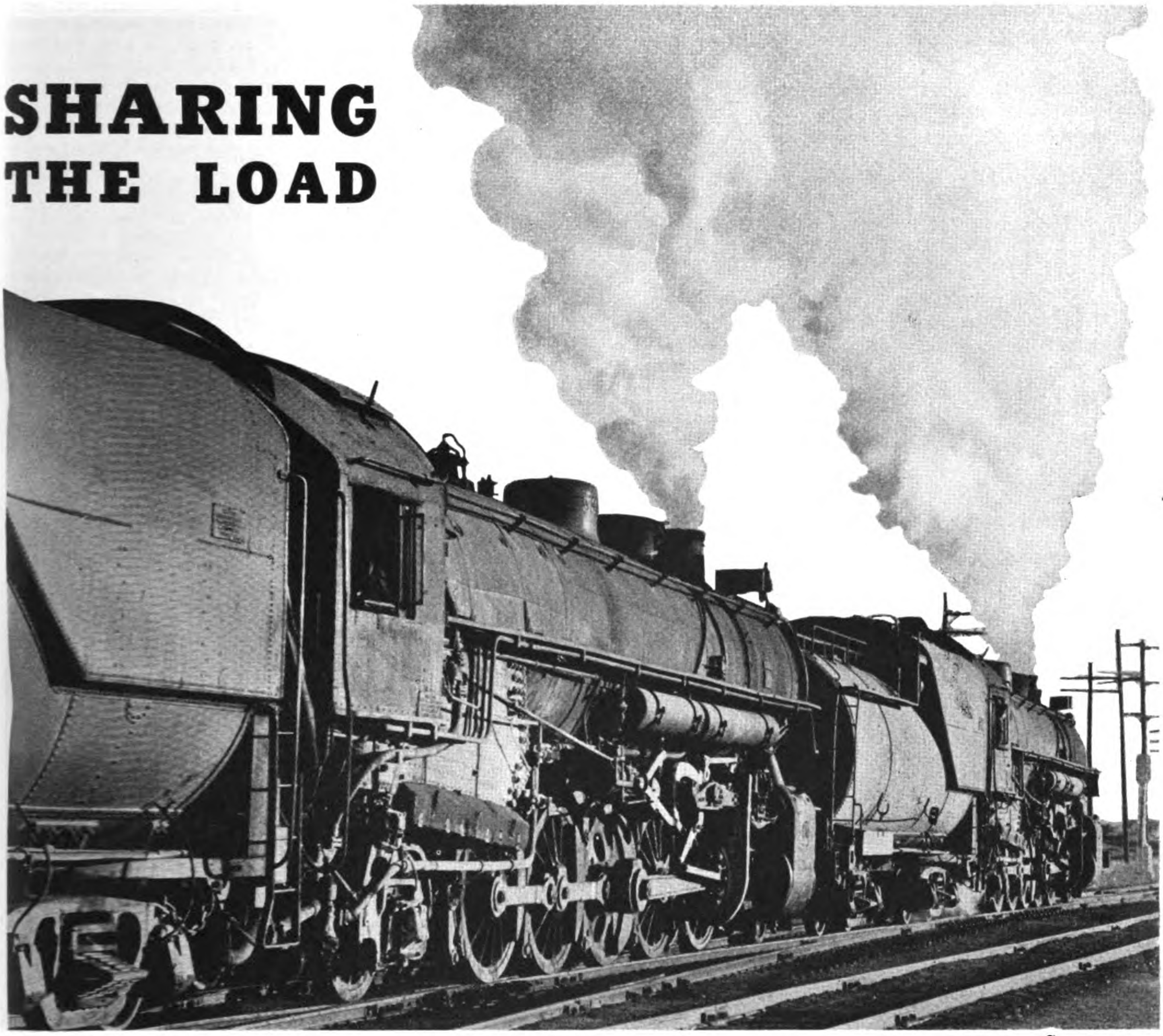
THE LANDIS MACHINE COMPANY has completed an addition to its plant at Waynesboro, Pa. The addition includes a structure of brick, concrete, and steel, 60 ft. by 350 ft., which will house a new erecting floor and shipping department. A wing, 50 ft. by 80 ft., extending from the main structure at the shipping department, will house a box and crate manufacturing department as well as a lumber storage. A second building, 30 ft. by 60 ft., one story in height, and of brick and reinforced concrete construction, is for the storage of chips and cuttings, according to their physical analysis.

◆

JONES & LAUGHLIN STEEL CORPORATION.—*John B. De Wolf* has been transferred as district sales manager of the Jones & Laughlin Steel Corporation from New York to Washington, D. C.; *S. A. Fuller* from Chicago to New York; and *Ernest W. Harwell* from Memphis, Tenn., to Chicago. *E. E. Hoehle*, formerly assistant district sales manager at Memphis, has been appointed sales manager in that city. *R. J. Woods, Jr.*, formerly sales engineer in the

(*Continued on next left-hand page*)

SHARING THE LOAD



THE responsibility for the cleaning of parts on the tonnage basis is no light burden — but railroad shop executives do not carry it unaided.

The practical experience and the resources of the largest producer of industrial cleaners are at their command—with Wyandotte Personal Service.

The complete removal of carbonized substances, stubborn dirt, grease and oil, requires a highly specialized cleaner — engineered for speed and economy.

Wyandotte Metal Cleaners are highly effective in railroad work — and economical. Railroad shop records in all parts of the country show that Wyandotte solutions "stand up" to heavy-duty cleaning, and require but little new material for replenishment. Also — their use permits only a very low percentage of rejects.

May we co-operate with you?

Wyandotte
PRODUCTS
SERVICE REPRESENTATIVES IN 88 CITIES

THE J. B. FORD SALES COMPANY, WYANDOTTE, MICHIGAN

Memphis office, has been appointed district sales manager in the company's new district sales office at Tulsa, Okla.

◆

JOHN W. SHEFFER, who has been associated with the American Car and Foundry Company since 1908, has recently been

J. W. Sheffer

appointed general electrical engineer of that company. Mr. Sheffer graduated from Cornell University in 1907 with a degree in mechanical engineering and later, in 1933, obtained his Master of Arts degree from Columbia University. He began his association with the American Car and Foundry Company in 1908 at the Berwick, Pa., plant, acting first as electrical engineer and later in the capacities of assistant to the general superintendent and plant engineer. During these 17 yars he was engaged also with welding developments of all description, and was particularly responsible for the development of the Berwick electric rivet heater. In 1926, he was transferred to the New York office and since that time has been occupied with improvement and development problems in the several plants. Major welding installations have been made at five plants of a. c. f. and its affiliates. Mr. Sheffer holds memberships in the American Institute of Electrical Engineers, American Welding Society, Iron and Steel Engineers and Cornwell Society of Engineers.

◆

A. H. BOND has been appointed Co-ordinator of War Industries Work of Oakite Products, Inc. Through Mr. Bond, whose headquarters will be at 757 North Broadway, Milwaukee, Wis., information on developments in production cleaning and related manufacturing operations essential to the manufacture of artillery, tanks, airplanes, etc., will be made available to various government officers and manufacturing executives in Washington and key production centers throughout the United States.

Obituary

FLOYD K. MAYS, vice-president of the Peerless Equipment Company, Chicago, died in that city on January 23. Mr. Mays was born in Richmond, Va., in December, 1886, and entered railway service with the Atlanta, Birmingham & Atlantic (now the A. B. & C.). In 1913 he was promoted to treasurer and purchasing agent at Atlanta, Ga., and in 1916, was appointed also secretary. In 1918, Mr. Mays was made assistant to the federal manager and purchasing agent, and in 1920, resigned to enter the employ of the Bradford Draft Gear Company. He remained with this company until July, 1932, when he was elected president of the newly formed Peerless Equipment Company, New York. When this company was purchased by Poor & Co., in 1936, he was elected vice-president at Chicago.

GEORGE H. GOODELL, railway equipment manufacturers' agent, died on December 27, 1941, in St. Paul, Minn. He was 71 years of age. Mr. Goodell, a graduate of the Massachusetts Institute of Technology, began his business career in 1893 as a special apprentice in the Grant Locomotive Works at Chicago and continued in that capacity

George H. Goodell

in 1893 and 1894 with the Baldwin Locomotive Works at Philadelphia, Pa. From 1894 to 1899 he served first as engineer of tests and then as mechanical engineer with the Erie at Susquehanna, Pa., and from 1899 to 1901 as mechanical engineer with the Northern Pacific at St. Paul, Minn. In 1901 and 1902 he was assistant chief engineer and chief engineer, respectively, of the Pressed Steel Car Company, Pittsburgh, Pa., and in 1902 and 1903 assistant to the president and chief engineer of the Standard Steel Car Company, Pittsburgh, Pa. From 1903 to 1928 he was a partner in the firm of Rank & Goodell in St. Paul, Minn., and from 1928 to 1937 senior partner of Goodell & Hoppe in that city. Since May, 1937, he had been active as a railway equipment manufacturers' agent in St. Paul.

Personal Mention

General

D. M. VANCE has been appointed mechanical inspector on the Texas & Pacific, with headquarters at Dallas, Tex.

M. J. YOUNG, assistant master mechanic on the Texas & Pacific at Ft. Worth, Tex., has been appointed general locomotive inspector, with headquarters at Dallas, Tex.

A. B. WELCH, supervisor of lubrication and valve pilot operation of the Texas & Pacific, has been appointed supervisor maintenance of equipment, with headquarters as before at Dallas, Tex. The positions of supervisor of lubrication and valve pilot operation and equipment maintenance supervisor have been abolished.

HARRY L. NANCARROW, general superintendent of the Lake division of the Pennsylvania at Cleveland, Ohio, has been appointed general manager of the Western region, with headquarters at Chicago. Mr. Nancarrow was born at Jersey Shore, Pa., on January 13, 1897, and graduated in mechanical engineering from Bucknell University in 1920. He entered railroad service on October 7, 1920, as draftsman in the office of the superintendent of motive power of the Pennsylvania at Philadelphia, Pa. On March 21, 1921, he was appointed a special apprentice at the Altoona machine shops, becoming inspector of motive power there on April 17, 1924. He was appointed gang foreman on the Cleveland division on September 1, 1924, and assistant enginehouse foreman on February 10, 1926. On March 1, 1927, he became assistant master mechanic on the Akron division, being promoted to master mechanic of the Erie & Ashtabula division on May 16, 1928. On January 1, 1929, he was transferred to the Baltimore division and then to the Philadelphia Terminal division. On September 16, 1936, he became superintendent of the Logansport division, being transferred to the Buffalo division on January 16, 1938. He became superintendent of passenger transportation

Harry L. Nancarrow

of the Eastern Region at Philadelphia, on May 1, 1939, and was appointed superintendent of the Pittsburgh division at Pittsburgh, Pa., on January 16, 1940. Mr. Nancarrow was promoted to the position of general superintendent of the Lake division on February 1, 1941.

H. M. Wood, master mechanic of the Pittsburgh, Conemaugh and Monongahela divisions of the Pennsylvania, has been appointed superintendent of the Logansport

H. M. Wood

division, with headquarters at Logansport, Ind. Mr. Wood was born in Altoona, Pa., on June 4, 1901, and was educated at Pennsylvania State College. He entered railway service as a clerk in the Altoona machine shop of the Pennsylvania on July 7, 1919. He became a machinist apprentice on June 15, 1922, a special apprentice in 1925, and motive-power inspector in 1927. In 1930 he went to Harrisburg, Pa., as a gang foreman and five years later became assistant foreman at Enola yard, Harrisburg. He became assistant master mechanic on the Pittsburgh division in 1936, and master mechanic of the Long Island Railroad on August 1, 1937. He returned to the Pittsburgh division of the Pennsylvania as acting master mechanic on May 16, 1941, and on December 1, 1941, was appointed master mechanic of the Western Pennsylvania general division, consisting of the Pittsburgh, Conemaugh and Monongahela divisions.

Walter O. Teufel, superintendent of the St. Louis division of the Pennsylvania at Terre Haute, Ind., has been promoted to general superintendent of the Southwestern division, with headquarters at Indianapolis, Ind. Mr. Teufel was born at Milton, Pa., on July 30, 1897, and attended Pennsylvania State College. He entered railway service on April 10, 1916, as an apprentice in the mechanical department of the Pennsylvania. On October 1, 1922, he was appointed motive-power inspector and on February 15, 1926, was promoted to assistant master mechanic at Wilmington, Del. Mr. Teufel was transferred to Altoona, Pa., on March 1, 1930, and on January 1, 1931, became master mechanic at New Castle, Pa. On May 1, 1932, he was appointed assistant master mechanic at New York and on November 1, 1933 became master mechanic at Buffalo, N Y. Mr. Teufel was later transferred to Pittsburgh, Pa., and Columbus, Ohio, and in July, 1939, he was promoted to the position of super-

Walter O. Teufel

intendent of the Indianapolis division, with headquarters at Indianapolis, Ind. In November, 1940, he was transferred to the St. Louis division, with headquarters at Terre Haute.

Alexander K. Galloway, superintendent of motive power and rolling equipment on the Reading at Reading, Pa., who has been appointed general superintendent of motive power and equipment of the Baltimore & Ohio at Baltimore, Md., as announced in the January issue of the *Railway Mechanical Engineer,* was born at St. Thomas, Ont., Canada, on October 1,

A. K. Galloway

1885. He entered railway service on June 1, 1902, as a machinist apprentice in the employ of the Michigan Central, becoming a machinist on June 1, 1906. He then served successively as enginehouse foreman and general foreman. On November 1, 1914, Mr. Galloway went with the Baltimore & Ohio as acting master mechanic of the Baltimore division, becoming master mechanic on July 1, 1915, and general master mechanic at Cincinnati, Ohio, on July 20, 1916. On February 1, 1917, he was appointed district master mechanic at Baltimore, and in April, 1927, superintendent motive power. He became superintendent motive power and rolling equipment of the Reading and Central of New Jersey in November, 1936.

W. B. Whitsitt, assistant chief of motive power and equipment on the Baltimore & Ohio, has been appointed chief engineer of motive power and equipment, in charge of research, design, standards and new construction, as noted in the January issue of the *Railway Mechanical Engineer.* Mr. Whitsitt was born on May 27, 1883, and entered railway service on March 16, 1903, as draftsman in the motive power de-

W. B. Whitsitt

partment of the Baltimore & Ohio at Newark, Ohio, later being transferred to the Mount Clare shops at Baltimore. On October 1, 1915, Mr. Whitsitt became apprentice instructor, Mount Clare shops; on September 1, 1917, assistant chief draftsman and chief draftsman on July 16, 1918. On October 1, 1922, he was appointed assistant mechanical engineer; on November 1, 1926 mechanical engineer, and in June, 1937, assistant chief of motive power and equipment at Baltimore.

Fred S. DeVeny, superintendent of the Baltimore & Ohio, Chicago Terminal, with headquarters at Chicago, has retired. Mr. DeVeny was born at Bourbon, Ind., on October 7, 1875, and, after attending college, entered railway service in September, 1894, as a car inspector on the Baltimore & Ohio. A year later he became a locomotive fireman and, in 1901, was promoted to locomotive engineer. In 1908 he became road foreman of engines and in May, 1920, was promoted to trainmaster of the B. & O., Chicago Terminal. Mr. DeVeny was promoted to superintendent on May 1, 1921.

H. C. Wyatt, superintendent of the Pocahontas division of the Norfolk & Western, at Bluefield, W. Va., has been appointed assistant general superintendent of motive power, with headquarters at Roanoke, Va. Mr. Wyatt started working for the Norfolk & Western during school vacation periods, and in June, 1924, was regularly employed as a special apprentice in the Roanoke shops. Since that time he has served as shop inspector at Roanoke and Bluefield, special apprentice at Portsmouth, Ohio; assistant foreman and foreman at Iaeger, W. Va.; assistant road foreman of engines, and general foreman at Columbus, Ohio. He was promoted to assistant master mechanic of the Radford and Shenandoah divisions in August, 1937,

(*Continued on second left-hand page*)

Transportation—the Backbone of the Nation

GENERAL MOTORS LOCOMOTIVES

Who Serves the Railro

Meeting the Challenge

AMERICAN railroads are today faced with the greatest transportation responsibility in our nation's history, that of moving the fast growing army of men, materials and supplies with safety and dispatch.

In meeting this challenge, General Motors Diesel locomotives in all classes of service are playing an important part, not only in promoting the conservation of vital war materials, such as metals and fuel, but many other operating advantages and economies. In this program the GM 5400 Hp. Diesel freight locomotives are particularly outstanding as evidenced by their ability to:

(a) Effect savings in train miles as much as 50 per cent, making one Diesel train mile the equivalent of two steam train miles.

(b) Release for other important service as many as five heavy steam locomotives for each Diesel locomotive operated.

(c) Increase the traffic hauling and time capacity; also availability for service.

(d) Provide faster schedules by eliminating many service delays now required for steam locomotives.

(e) Increase carrying capacity of existing track facilities without expensive rail replacements and rebuilding of bridge structures . . . this due to even weight distribution and low axle load of Diesels.

ELECTRO-MOT

GENERAL MOTORS CORPORATION

and two years later became superintendent of the Shenandoah division. In December,

H. C. Wyatt

1940, he was transferred to the Scioto division and on January 1, 1942, was transferred to the Pocahontas division.

F. H. Einwaechter, Jr., assistant engineer in the locomotive department of the Baltimore & Ohio, who has been appointed

F. H. Einwaechter, Jr.

mechanical engineer at Baltimore, Md., as announced in the January issue of the *Railway Mechanical Engineer,* entered the service of the Baltimore & Ohio as an apprentice in 1913. In 1917, he was promoted to draftsman and in July, 1923, became leading draftsman. Mr. Einwaechter was appointed assistant engineer at the Mount Clare shops in June, 1927, and assistant engineer in the locomotive department in June, 1937.

Master Mechanics and Road Foremen

W. F. Ely, engineman, New York division of the Pennsylvania, has become road foreman of engines, Maryland division.

C. J. Sears, road foreman, Chicago terminal division of the Pennsylvania, has been appointed road foreman of engines, Columbus division, with headquarters at Columbus, Ohio.

H. H. Jones, master mechanic on the Union Pacific at Los Angeles, Calif., has been transferred to Cheyenne, Wyo.

E. Pool, returning to duty following a period of illness, has been appointed master mechanic of the Erie at Hornell, N. Y.

F. J. Macofee, road foreman of engines on the Delaware, Lackawanna & Western at East Buffalo, N. Y., has been transferred to Scranton, Pa.

William C. Sturm has been appointed road foreman of engines on the Delaware, Lackawanna & Western, with headquarters at East Buffalo, N. Y.

B. H. Davis, road foreman of engines on the Delaware, Lackawanna & Western, with headquarters at Scranton, Pa., has retired on pension.

H. L. Conner, traveling fireman on the New York, Chicago & St. Louis, has been appointed assistant road foreman of engines, with headquarters at Frankfort, Ind.

J. W. Martin, general foreman on the Illinois Central at Waterloo, Ia., has been appointed assistant master mechanic at Markham (Chicago), Ill.

M. A. Quinn, master mechanic on the Delaware, Lackawanna & Western, with headquarters at East Buffalo, N. Y., has resigned.

Adam Taylor, fireman instructor, Philadelphia division of the Pennsylvania, has become assistant road foreman of engines of the Long Island Railroad.

E. A. McClain, assistant road foreman of engines, Philadelphia Terminal division of the Pennsylvania, has become assistant road foreman of engines, New York division.

T. M. Conniff, general foreman in the motive power department of the Delaware, Lackawanna & Western at Scranton, Pa., has been appointed master mechanic at East Buffalo, N. Y.

E. K. Shamblen, special duty engineman, Toledo division of the Pennsylvania, has become assistant road foreman of engines, Columbus division, with headquarters at Columbus, Ohio.

W. A. Shields, assistant road foreman of engines, Columbus division of the Pennsylvania, has been appointed road foreman of Engines, Chicago Terminal division, with headquarters at Chicago.

W. L. Jones, master mechanic on the Illinois Central at Champaign, Ill., who has been transferred to Jackson, Tenn., as noted on page 42 of the January, 1942, issue of the *Railway Mechanical Engineer,* was born on October 6, 1894, at Cairo, Ill. Mr. Jones entered railway service with the Illinois Central on August 1, 1907, as a machinist apprentice at Cairo. He completed his apprenticeship on August 1, 1911, and until April, 1925, served successively as a machinist on the Illinois Central at Jackson, Tenn.; on the Alabama Great Southern at Birmingham, Ala.; on the Mobile & Ohio at Meridian, Miss.; and on the Southern at Sheffield, Ala. From April, 1925, to April, 1933, he was division air brake foreman at Jackson, with the exception of the period from September, 1929, to June, 1930, when he acted as assistant general air brake engineer on the Illinois Central at Chicago. In April, 1933, he was promoted to general foreman on the Illinois Central at Paducah, Ky., and in May, 1937, was transferred to the position of general foreman at Centralia, Ill. In November, 1939, he was appointed

W. L. Jones

acting master mechanic at Champaign and in July, 1940, became master mechanic at Champaign.

D. L. McMillan, assistant master mechanic at the Markham (Chicago) yard of the Illinois Central, who has been appointed master mechanic at Champaign, Ill., as noted on page 90 of the February issue of the *Railway Mechanical Engineer,* was born on August 23, 1889, at Water Valley,

D. L. McMillan

Miss. Mr. McMillan attended Water Valley public school and high school and in July, 1906, entered railway service with the Illinois Central as machinist apprentice at Water Valley. From 1910 to 1916, he was a machinist at Water Valley and in 1917 became enginehouse foreman at McComb, Miss. He served with the U. S. Army at home and in France from 1917 to 1918, and in July, 1919, was appointed enginehouse foreman of the Illinois Central at Vicksburg, Miss. In August, 1926, Mr. McMillan became general foreman at McComb and in July, 1939, was appointed assistant master mechanic at Markham.

Shop and Enginehouse

John Hughes has been appointed enginehouse foreman of the New York, Chicago & St. Louis, with headquarters at Lima, Ohio.

A. H. ADANG has been appointed general foreman at the Conneaut, Ohio, shops of the New York, Chicago & St. Louis.

CHARLES F. KLEIN, night enginehouse foreman on the Delaware, Lackawanna & Western at Elmira, N. Y., has become enginehouse foreman at Elmira.

J. J. NELSON, boiler foreman on the Delaware, Lackawanna & Western at East Buffalo, N. Y., has been appointed enginehouse foreman, with headquarters at East Buffalo.

J. C. MILLER, general and erecting foreman of the New York, Chicago & St. Louis at Conneaut, Ohio, has been appointed superintendent of shops, with headquarters at Conneaut.

M. O'MEARA, assistant foreman on the Delaware, Lackawanna & Western, at Scranton, Pa., has been promoted to enginehouse foreman, with headquarters at East Binghamton, N. Y.

J. J. MCHALE, enginehouse foreman on the Delaware, Lackawanna & Western, at Kingston, Pa., has been appointed general foreman, locomotive department, with headquarters at Scranton, Pa.

Car Department

J. G. BOURGEOIS, has been appointed acting car foreman, on the Canadian National at Riviere du Loup, Que.

W. T. MADDEN, district car foreman on the Canadian National at Moncton, N. B., has retired.

A. G. CREMEAN has become general car foreman of the New York, Chicago & St. Louis at Frankfort, Ind.

J. E. RICHARD, car foreman on the Canadian National at Riviere du Loup, Que., has been appointed district car foreman, with headquarters at Moncton, N. B.

FRANK H. BECHERER, assistant superintendent of motive power and rolling equipment of the Central of New Jersey at

Frank H. Becherer

Elizabethport, N. J., has been appointed superintendent of the car department of the Baltimore & Ohio at Baltimore, Md., as noted on page 90 of the February issue.

Mr. Becherer was born at New York on August 23, 1882, and entered railway service in 1901 as billing clerk in the office of the master car builder of the Erie, subsequently becoming chief clerk in its car division. From 1907 until 1918 he served in various positions in the car department of the Pennsylvania and in 1919 became junior inspector of car equipment. During 1919 and 1922 he was senior mechanical engineer, Bureau of Valuation, Interstate Commerce Commission. In 1923, Mr. Becherer went with the Boston & Maine as mechanical inspector and was promoted to assistant to mechanical superintendent in 1925. He joined the Central of New Jersey in 1926 as superintendent car department and in 1930 was appointed assistant superintendent motive power and rolling equipment.

Purchasing and Stores

CLIFFORD G. ALLEN has been appointed purchasing agent of the Akron, Canton & Youngstown and the Northern Ohio, with headquarters at Akron, Ohio, succeeding R. A. McKinnon, who has resigned.

N. C. JOHNSON has been appointed acting purchasing agent of the Nashville, Chattanooga & St. Louis, with headquarters at Nashville, Tenn., succeeding J. M. Paulus.

A. W. HIX, assistant general purchasing agent of the Chesapeake & Ohio, the New York, Chicago & St. Louis (Nickel Plate) and the Pere Marquette, with headquarters at Cleveland, Ohio, has been promoted to acting general purchasing agent, with the same headquarters, succeeding Richard M. Nelson, who has been granted a leave of absence because of ill health.

E. J. LAMNECK, purchasing agent of the Pennsylvania, has been appointed general purchasing agent, with headquarters

E. J. Lamneck

at Philadelphia, Pa. Mr. Lamneck was born in Ohio on June 27, 1887, and entered railroad service in 1907 as a truck builder on the Pittsburgh, Cincinnati, Chicago & St. Louis (now P. R. R.) at Scully, Pa. He was appointed to a clerkship in 1910 and later transferred to the purchasing department. In 1921 he was advanced to assistant to the purchasing agent of the Central region and upon consolidation of the purchasing department forces in Philadelphia in 1924 he became assistant to the purchasing agent for the system. In 1929 he was appointed fuel purchasing agent and in 1934 he was promoted to purchasing agent.

Obituary

ROY M. WILSON, general foreman of the Erie at Port Jervis, N. Y., died on January 15.

BENJAMIN DUPONT, a retired master mechanic of the Louisville & Nashville, died at New Orleans, La., on February 14.

HILLMAN H. HARVEY, who retired on November 1, 1938, as general car foreman of the Chicago, Burlington & Quincy, with headquarters at Chicago, died at his home in that city on February 1.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

"BRAKE SHOE AT WAR."—The American Brake Shoe and Foundry Company, 230 Park avenue, New York. Twelve-page booklet reports on the company's role in producing materials of war in its 58 plants. Many illustrations.

◆

PORTABLE ELECTRIC TOOLS.—Independent Pneumatic Tool Company, 600 W. Jackson boulevard, Chicago. Sixty-four-page catalogue (No. 37) of 1942 line of Thor portable electric tools.

◆

MACHINE CUTTING TIP.—Air Reduction Sales Company, 60 East Forty-second street, New York. Eight-page illustrated booklet, ADC-631, describes the new Airco "45" high-speed machine cutting tip, with performance facts and figures in text and chart form.

◆

CARE AND CLEANING OF HANDS AND ARMS.—Magnus Chemical Co., Inc., Garwood, N. J. Twenty-four-page Technical Bulletin No. 51 entitled "The Care and Cleaning of Hands and Arms in the Industrial Plant."

◆

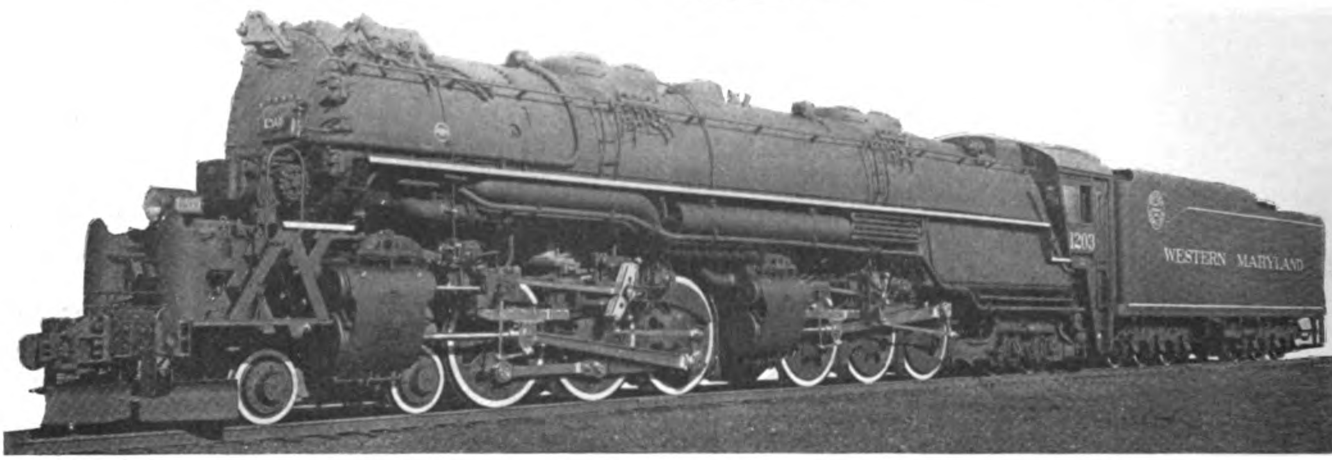
"DRILL AND REAMER FACTS.—Whitman & Barnes, 2108 West Fort street, Detroit, Mich. Thirty-two-page booklet in two sections: Drill Facts, describes and illustrates design and construction of twist drills; correct drill pointing, etc.; Reamer Facts contains a short treatise on design, construction, use and care of reamers, etc.

◆

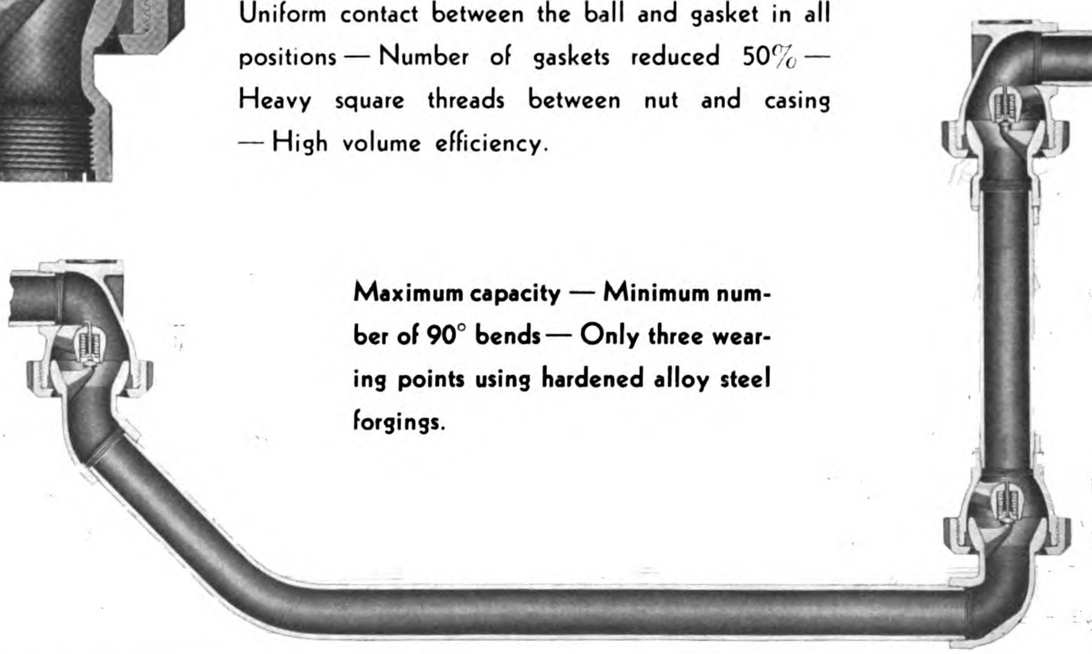
WOODWORKING MACHINES.—De Walt Products Corporation, Lancaster, Pa. Twenty-page booklet illustrates and briefly describes De Walt wood-cutting machines and operations.

◆

ELECTRIC STRAIN GAGES.—General Electric Company, Schenectady, N. Y. Eight-page booklet (GEA-3673) describes and illustrates different types of gages for measuring mechanical strains, and discusses their operation.



WESTERN MARYLAND
1203



Railway Mechanical Engineer

APR 13 1942

April
1942

FOUNDED IN 1832

Published monthly by Simmons-Boardman Publishing Corporation, 1309 Noble Street, Philadelphia, Pa. Entered as second-class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, $3.00 for one year, U. S. and Canada. Single copies 35 cents. Vol. 116, No. 4

RAILWAY MECHANICAL ENGINEER

Founded in 1832 as the American Rail-Road Journal

With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office.

Volume 116 *No. 4*

Roy V. Wright
Editor, New York

C. B. Peck
Managing Editor, New York

E. L. Woodward
Western Editor, Chicago

H. C. Wilcox
Associate Editor, New York

J. L. Stover
Associate Editor, New York

Robert E. Thayer
Vice-Pres. and Business Manager, New York

APRIL, 1942

Published on the second day of each month by

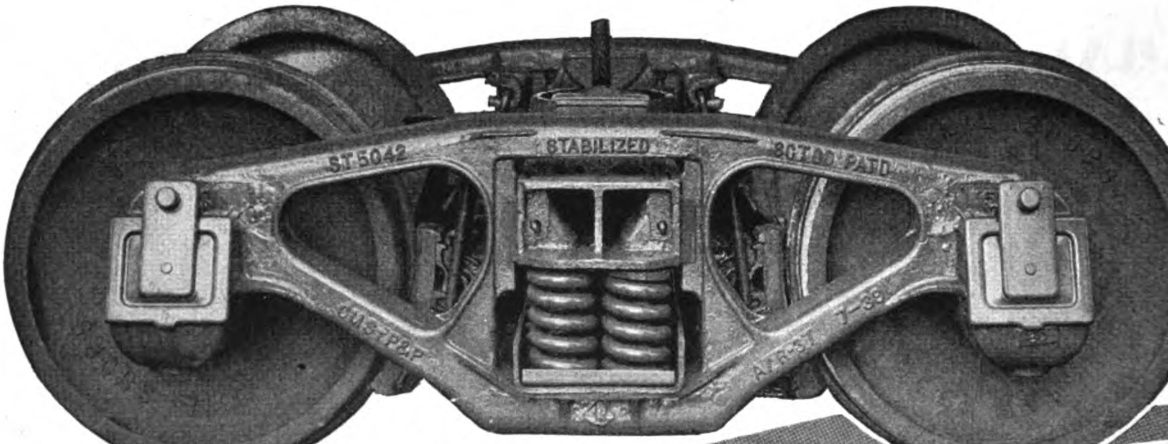
Simmons-Boardman Publishing Corporation

1309 Noble street, Philadelphia, Pa. Editorial and Executive Offices: 30 Church street, New York, and 105 West Adams street, Chicago. Branch offices: Terminal Tower, Cleveland; 1081 National Press bldg., Washington, D. C.; 1038 Henry bldg., Seattle, Wash.; 550 Montgomery street, Room 805-806, San Francisco, Calif.; 530 W. Sixth street, Los Angeles, Calif.

Samuel O. Dunn, *Chairman of Board, Chicago;* Henry Lee, *President, New York;* Roy V. Wright, *Vice-Pres. and Sec., New York;* Frederick H. Thompson, *Vice-Pres., Cleveland;* Elmer T. Howson, *Vice-Pres., Chicago;* Frederick C. Koch, *Vice-Pres., New York;* Robert E. Thayer, *Vice-Pres., New York;* H. A. Morrison, *Vice-Pres., Chicago;* John T. DeMott, *Treas. and Asst. Sec., New York.*

Subscriptions (including, when published, the daily editions of the Railway Age, published in connection with the convention of the Association of American Railroads, Mechanical Division), payable in advance and postage free, United States, U. S. possessions and Canada: 1 year, $3; 2 years, $5. Foreign countries, not including daily editions of the Railway Age: 1 year, $4; 2 years, $7. Single copies, 35 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.), and is indexed by the Industrial Arts Index and also by the Engineering Index Service. Printed in U. S. A.



★ ★ ★ ★

Freight Cars–as well as War Materials–Are Vital for Victory–Trucks with STABILIZED PARTS PROTECT 'EM BOTH!

Specify Stabilized Parts for Trucks on new and rebuilt cars . . . and you give these cars and the vital war lading they carry utmost protection from the countless jars and bumps they receive in speeding to their destination.

At small cost, these Stabilized Parts are built into the bolsters . . . where they eliminate all looseness and produce sufficient friction to minimize excessive spring bouncing and harmonic action. Trucks are assembled initially tight and *stay tight*—as any slight wear on the friction casting is automatically taken up.

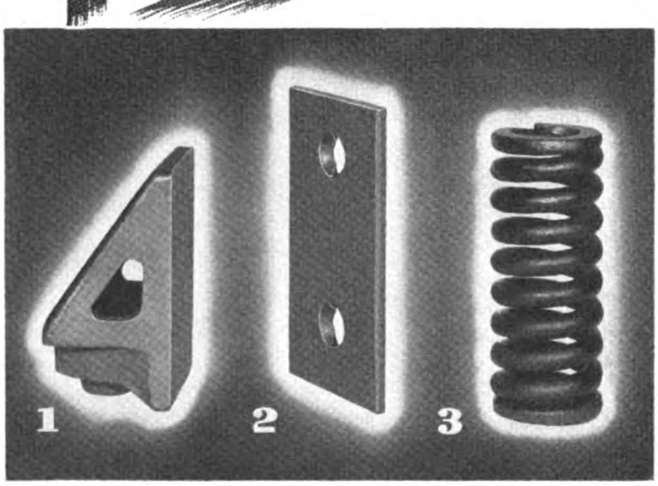
Cars with Stabilized Trucks get a smooth, floating ride — free of the excessive spring bouncing that is so destructive to equipment and lading.

Over 58,000 Car Sets Of Stabilized Trucks Giving Satisfactory Service On 44 Roads and Private Car Lines

STANDARD CAR TRUCK COMPANY

332 So. Michigan Ave. Chicago, Ill.

★ ★ ★ ★



The Stabilized Parts Consist of:

1 Friction Casting with large friction-bearing area

2 Spring Steel Wear Plate

3 Friction - Casting - Supporting Side Spring

At small cost, they are built into new trucks for new and rebuilt equipment. So specify these Stabilized parts . . . for the protection your cars and lading need under today's wartime conditions.

Every Member of the Mechanical Department Challenged

We are in a war and the railroads are one of the most vital factors in a successful outcome

Last October, two months before our country became an active combatant in the World War, the *Railway Mechanical Engineer* pointed out the vital part that the railroads must take in increasing production in the United States, to make possible the success of those nations that were so desperately fighting the Axis powers. In modern mechanized warfare, the most essential factor is the ability to produce the vast amount of material which is required. American railroads could easily prove the bottleneck in this stupendous production effort. They have been and still are badly handicapped because of the lack of essential materials to enlarge their plants and equipment to meet the emergency. Obviously the mechanical department, that has charge of the construction, maintenance and repair of the equipment, is quite decidedly on the spot.

We must exercise our ingenuity to the limit and make a maximum use of the facilities and equipment at our disposal. Incidentally, not the least of our difficulties is the fact that so many of the workers in the mechanical department have been, and still are being drawn into the various fighting services. The necessity now is, of course, all the greater, since we are actively involved in the World War and our boys are already to be found on fighting fronts throughout the world.

In the effort to help the railroads make good, the *Railway Mechanical Engineer* last October announced a competition for articles on the ways and means of improving the mechanical department's operations or practices to increase production and secure a larger availability of the equipment. The returns from this competition greatly exceeded our expectations. We had intended to devote only part of this issue to them, but find ourselves so deluged with excellent material, that in spite of the fact that we have considerably enlarged this issue, as compared to normal ones, we still have considerable first-class material that will be run in the May number, or as quickly thereafter as possible.

We hope that the spirit of the competition will not die out with the publication of these articles. The men that have participated have taken the lead in a splendid forward movement. As you read their articles, however, you may see other ways in which production and efficiency may be increased, and which can be drawn to the attention of the railroad mechanical field to excellent advantage. Good as some of the suggestions are in this issue, some of you may already be using still better methods. We hope, therefore, that you will sit down immediately and advise us as to methods and practices that will be of special value at this time. The participants in the contest have done their part and we surely greatly appreciate it. It is up to the rest of you now to chip in your comment or contribution. In other words, the next move is up to you!

We should like to take this opportunity, also, of expressing cordial appreciation to many of our advertisers for adjusting their advertising copy to the objectives of this issue.

● ● ●

The Story of the Contest

It was quite evident when the four mechanical conventions were held in Chicago late last September, that production of war materials and supplies would have to be speeded up greatly if this country, the Arsenal of Democracy, was to turn the tide in the World War and insure the defeat of the Axis powers. In spite of the fact that the railroads had not been able to secure the equipment which it was anticipated would be necessary to handle the peak load of the year, it was evident at that time that because of the fine spirit of co-operation on the part of the workers, managements and the shippers, they would squeeze over the peak without a shortage of equipment. At the same time it was recognized that there must be a still more intensive production in the months to follow, if this country was to make its influence felt at probably the most critical period in the world's history.

Because inadequacy of equipment promised to be the bottleneck so far as the railroads were concerned, the attendants at the meetings of the Railway Fuel and Traveling Engineers' Association, the Locomotive Maintenance Officers' Association, the Car Department Officers' Association and the Master Boiler Makers' Association, recognized that they were pretty much on the spot. It was recognized that everything possible must be done to secure a greater utilization of all of the equipment and facilities in charge of the mechanical department. During the closing hours of these conventions the editors of the *Railway Mechanical Engineer* made a broad survey of the situation and then decided to promote the contest, the results of which are reported in this issue.

It is doubtful if any other competition in our field has been so thoroughly promoted. The front page of the *Railway Mechanical Engineer* containing the convention reports first announced it. It was, of course, commented upon in succeeding issues. In addition to this, however, every railroad subscriber was written to. The co-operation of the heads of the mechanical departments was also requested, and as a result many of them secured additional copies of the announcement of the contest and saw to it that these reached people in their organizations that they thought might be interested. Employees' magazines of some of the railroads also helped to spread the news.

75 Contributions Received

The contest was announced to close on January 15. When the final returns were in there were 75 contributions, coming from 28 states and two Canadian provinces. They covered 62 cities in the United States and two in Canada. Literally, they came from railroad men from Ontario to Texas and from Maine to California. While it is impossible to use, in this particular number, all of the contributions that we shall reproduce in full or in part, a rough survey of the issue will indicate that a wide variety of crafts and occupations are represented and that contributions were received all the way from mechanical department executives down to apprentices.

The judges had a difficult task to decide upon the winners. Many of the suggestions were such that they could be applied promptly. Others could not be productive in a large way until considerable time had elapsed after their application. Obviously, because of the nature of the contest and the emergency with which our country is faced, those which could not insure reasonably prompt results were set to one side, so far as consideration for the first and second prizes was concerned. The more important of these, however, are either used in this issue or will appear later, for this promises to be a very long drawn-out war and we shall need to apply every device possible to increase production and keep the equipment rolling.

The next point that received consideration was the extent of the speeding up of production or greater availability of the equipment which might result from the suggestions which were made. This naturally eliminated a large number of contributions which are excellent in themselves, so far as the activity which they represent is concerned, but could not qualify in the large for one of the prizes. As a matter of fact, it was apparent that there were no one or two, or a dozen, or a thousand suggestions that could bring about the results which are necessary, if the railroads are to make good in meeting the demands that are to be made upon them. Every possible advantage must be taken of even little and seemingly unimportant things if we are to win out.

Practical Value of Morale

Another factor that greatly impressed the judges was the large number of contributions which emphasized the fact that possibly the greatest potential force which could be developed in the emergency was that involved in a more intelligent and thorough participation by every worker in helping to bring up the efficiency and production in the mechanical department. This will require a rapid building up of the morale, which, of course, is a responsibility of management. Here lies one of our very great possibilities, if our officers and supervisors can adjust themselves quickly enough to the situation and develop a spirit of cordial and intelligent co-operation on the part of every man under their direction.

We Need Your Individual Help

While many of the contributions are reproduced in this issue, or will be in the next two or three issues, it does not mean that the *Railway Mechanical Engineer* is content with what has been accomplished. We have only started on our program. We can only make the largest contribution if our readers will co-operate with us to the fullest extent by helping, on the basis of what has already been presented, in pointing out other and better ways to increase the efficiency and production of every phase of the mechanical-department activities. We not only invite you to join with us in this effort, but we plead with you to work with us and assist us.

Greater Equipment Capacity Secured By

Increasing Availability

N. M. Trapnell

By N. M. Trapnell and J. B. Blackburn*

First Prize Winners

Locomotive availability can be increased by reducing time at terminals—Car repairs can be speeded up by the proper segregation of work

J. B. Blackburn

One of the most important problems facing mechanical department officers on American railroads today is the necessity for increasing the availability of locomotives and cars. This necessity exists because of the increasing amount of traffic which the railroads are being called upon to handle, combined with the difficulty and length of time required to obtain additional units of equipment.

The problem is intensified by the present labor and material situation. Defense industry is necessarily absorbing a large part of the skilled labor supply, making it difficult for the railroads to obtain the mechanics required to maintain their equipment. The same condition exists in the case of materials, many of which are now rationed on a strict priority basis. This situation will undoubtedly become more difficult for the railroads before it improves.

There are two principal phases of the problem which are closely related but which tend to oppose one another in accomplishing the desired result. They are (1) the necessity for maintaining the equipment in the best possible condition to avoid failure and road delays; (2) the necessity for reducing to a minimum the time required for repairs and servicing at shops and terminals.

These two phases, together with the labor and material situation, require considerable ingenuity and good judgment on the part of mechanical department officers in solving the problem. However, solved it must be if the railroads are to handle successfully the abnormal amount of traffic created by the present emergency and defense program. In other words, the railroads must now make more use of equipment they have than when the supply of locomotives and cars was plentiful.

Under present conditions, the active life of a locomotive or a car may be divided as follows:

Locomotives

(a)—Time on road hauling trains.
(b)—Time at terminal for servicing and inspection.
(c)—Time in enginehouse or shop for repairs.

Cars

(a)—Time on road moving in trains.
(b)—Time in terminal yards for switching, classification and inspection.
(c)—Time on repair tracks or in shop for repairs.
(d)—Time loading and unloading at origin and destination.

* Assistant superintendent motive power and mechanical engineer, respectively, Chesapeake & Ohio.

In the case of the locomotive, parts (b) and (c) are under the control of the mechanical department, and this amounts to approximately 30 per cent of the total time. In the case of the car, the mechanical department controls part (c) and a portion of part (b), which amounts to less than one per cent of the total time. It is proposed in this article to discuss ways and means of reducing the time, controlled by the mechanical department, that have been tried and proven under actual operating conditions without introducing radical changes in present practices or excessive expenditures for facilities.

Scheduling Locomotive Running Repairs

One of the most fertile fields for improvement in the availability of motive power is the method of handling running repairs; therefore, the time required and the quality of work performed must be given careful consideration. There are two principal methods of handling such repairs, i. e. (1) perform the work currently as the need for repairs becomes evident; (2) concentrating the work, as far as is possible, at monthly, quarterly, semi-annual and annual inspections.

The first method is the oldest and is most generally used; it has, however, certain disadvantages which are becoming more widely recognized, particularly on the larger roads, as the demand for power becomes greater. This has resulted in a trend toward the second method.

Running repairs must, of course, be made if and when the need becomes evident; otherwise engine failures and road delays will result. However, the time at which the need becomes evident can be controlled to a large extent by anticipating the work required and scheduling it to be performed somewhat in advance of the need.

When running repairs are made only as the actual necessity develops and no attempt is made to anticipate the work, the locomotive must frequently be held out of service between periodical inspection periods. Also, the amount of work required on incoming locomotives is not known until after they arrive at the terminal and an inspection can be made. This renders it difficult to maintain an accurate check on the condition of the locomotives at all times and to supply the motive power requirements of the service, unless an excess number of locomotives are available.

Another disadvantage in the first method is that the amount of work to be done in the enginehouse may fluctuate to a great extent. For instance, it may happen that several locomotives will arrive at the terminal within a short time, all requiring a considerable amount of running-repair work before they can be despatched, while at other times there may be little work required on the locomotives at the terminal.

This means that if the locomotives are to be despatched promptly, there must be a sufficient force on hand at all times to take care of the peak requirements on running repairs, otherwise there will be a delay in getting some locomotives ready when the work is heavy. Under these conditions it is sometimes difficult to keep all of the force busy during slack periods, which results in an increase in the cost of running repairs. On the other hand, if the running repair work is concentrated as far as is possible at periodic inspections and if these periodic inspections are distributed evenly throughout each month, there will be a reduction in the time out of service for repairs and it will be easier to maintain a balanced efficient force in the enginehouse.

In addition to this, the following benefits will be derived:

(a)—Most of the running repair work will then be scheduled in accordance with the inspection schedule.

(b)—The condition of the motive power will be known in considerable detail at all times.

(c)—The amount of work to be done in the enginehouse each day can be determined accurately beforehand.

(d)—The availability of the locomotives will be increased.

(e)—The cost of running repairs will be reduced.

It is, of course, not possible to confine all running repair work to periodic inspection periods; the bulk of it, however, can be if the system is properly organized and the only work to be done on a locomotive between such periods should be either that of a minor nature or that resulting from accidents and other similar unforeseen circumstances.

It may be said that, under method No. 2, (namely, concentrating work at inspection periods) the time required for periodic inspection will be increased and that there will be an increase in the cost of material because some of it will be renewed before it is completely worn out if repairs are anticipated. This is true to a certain extent, but experience has demonstrated that the advantages of this method far outweigh the disadvantages, particularly where many locomotives are involved.

When handling running repairs in accordance with the second method, such work as renewing rod bushings, crown brasses, truck journal brasses, cylinder or valve packing, taking up lateral, babbitting crossheads, renewing staybolts, rolling and welding flues, testing and grinding superheater-header joints, renewing springs, tightening pedestal binders, adjusting wedges, etc., should be done at the inspection period when it is thought that such items will reach the condemning limit, leak or fail, before the next inspection period. This is in addition to the work required by the laws, rules and instructions of the I. C. C. Bureau of Locomotive Inspection.

It has been found helpful, where this system has been adopted, to provide a form covering the work to be checked or done on periodical inspections. This form lists the various items to be taken care of with space for recording the repairs made and the name of the man making each repair. The use of such a form helps insure that all necessary work is done and provides an excellent record of repairs made and of the condition of the locomotive.

The second method of handling running repairs was devised originally to reduce cost and stabilize the maintenance force in the enginehouse. It has since proved invaluable in increasing the availability of the motive power. In certain cases it would now be impossible to operate under the older hit-or-miss method of taking locomotives out of service for repairs only when the need for such work becomes imperative, without a considerable increase in the number of locomotives required to handle the service.

Adequate Supervision of Outside Forces at Engine Terminals

In general, the maintenance forces in shops and enginehouses, which include the skilled mechanics performing repair work, are organized with reasonable efficiency and are adequately supervised. More attention is usually paid to the supervision of these men than to the so-called "outside forces" which include hostlers, coal-dock men, fire cleaners, watchmen, supply men, etc.

In many cases the supervision of the outside forces is inadequate and much can be accomplished toward expediting the dispatching of locomotives if adequate supervision is provided. Such forces are composed principally of unskilled labor which must be followed up more close-

ly than the skilled maintenance force. The supervision required depends, of course, on the size of the engine terminal, the number of locomotives to be dispatched and, to a certain extent, on the facilities available.

The outside force handles the movement of locomotives about the terminal, taking on coal, water and sand, cleaning fires, blowing down boilers, washing locomotives and the checking of tools and supplies. They also unload and elevate fuel coal at coaling stations, dry sand, clean ash pits and, in many cases, fill lubricators and grease plugs and pack journal cellars on the locomotives. They are responsible for the time required to get the locomotive into the enginehouse for repairs after it is received at the engine terminal. This may take from one to four hours depending on the amount of work to be done, the size of the locomotive and the arrangement of the facilities, and accounts for a considerable proportion of the total time required to dispatch the locomotive.

It is too much to expect one enginehouse foreman to supervise directly the outside forces handling this work in addition to the running-repair forces in the enginehouse at a busy engine terminal. However, such is the case in many instances. It has been found that the time required to get locomotives into the enginehouse after arrival at the terminal can be reduced from 20 to 50 per cent by having adequate outside supervision.

The outside supervision required will depend on the size of the terminal and the number of locomotives being handled. At large terminals during busy periods, it is often advantageous to employ an outside, or ready-track foreman, who has direct supervision over all outside forces and their work, and who reports to the enginehouse foreman. At medium-size terminals the coal dock foreman can often be made responsible for the work of the outside forces and getting the locomotives handled promptly. At the smaller points, where labor agreements permit, it has often been found advantageous to appoint a lead hostler, or working foreman, who, in addition to hostling locomotives will exercise supervision over outside forces and expedite locomotive handling.

Terminal Facilities

It has been found that the arrangement of terminal facilities not only affects the time required to despatch locomotives but also the performance and time spent on road. For instance, stuck wedges and corresponding hot journals as well as rough-riding locomotives can be eliminated by providing inspection pits so that wedges can be adjusted as soon as the locomotives arrive at the terminal while the boxes and their component parts still have their running temperatures. Experience has proved conclusively that, depending on differences in box design, thickness of crown brasses, etc., the expansion and contraction of boxes will vary to such an extent that wedge adjustment cannot be made accurately except under running temperatures.

Likewise, by providing facilities so that the driving boxes can be inspected and packed while they still are at running temperatures, better lubrication will result and a percentage of hot journals will be eliminated because there will be sufficient heat to soften the surface of the grease and allow it to start flowing through the holes in the perforated plate in the cellar. When boxes have to be packed cold as is the case when locomotives are outshopped after being given classified repairs this can be accomplished by pressing the grease cake in the perforated plate under a hydraulic press or by applying soft grease on the axle side of the plate, or both.

Experience has also shown that in many cases the servicing of equipment can be expedited by the relocation of coal, water, sand and ash pit facilities. In other words, if these are conveniently located and so spaced that the operations of coaling, sanding, cleaning the fire, filling the tank, greasing and filling the lubricators, etc., can be performed at one time the result will be an increase in efficiency and a definite saving in terminal time. Likewise, particularly at the larger terminals it may be found advantageous to provide multiple coal, water, sand or ash-pit facilities.

Many benefits have been derived from the establishment of the "dual inspection system," that is, by maintaining the usual inspection of the power before it is moved into the enginehouse and supplementing this by a second final inspection after all work reported has been done prior to returning the locomotive to the ready track. Where this cannot be done in the enginehouse, outbound inspection pits should be provided.

An excellent method of reducing terminal time is to expedite the blowing-down of locomotives. Most roads have found that the use of treated water and a blowdown system is either necessary or desirable. In a great many cases, particularly in bad water districts, considerable blowing is mandatory to reduce the concentration of dissolved solids in boiler wash and to remove the sludge participated by the treatment.

The application of blow-off mufflers of the overhead type materially aids in reducing terminal time because with locomotives so equipped it is not necessary to blow the locomotive at some predetermined point but they can be blown safely at practically any yard location.

It has also been found that the amount of terminal blowing necessary can be reduced by equipping the locomotives with and using a continuous blow-down system on line of road. This can then be supplemented by hand blowing when water conditions make it necessary.

Freight-Car Repair-Track Work

Freight-car repair track work, like that in locomotive enginehouses, should never be speeded up at the expense of maintenance. The correct balancing of the available forces and adequate supervision along with the re-arrangement of existing facilities will increase repair-track production and obtain maximum efficiency.

An outstanding improvement that can be made in freight-car running repair work is the adoption of a so-called *wheel* "spot system," whereby all cars requiring wheel work are placed on a separate track, adjacent to the wheel storage tracks, set aside for this purpose. The wheel spot should be located about midway of this separate track so that the cars shopped for wheel work can be placed on one side of it and the finished cars can be pulled off the other side. This wheel spot should be equipped with (1) a winch for pulling cars along the track on and off the wheel spot; (2) concrete foundations for lift jacks at each end of the car spot; (3) ball-bearing wheel carriage set at a 90 deg. angle adjacent to the wheel storage tracks; (4) special hoist for lifting truck side frames and bolsters; (5) swing air hoist for unloading new and loading scrap wheels and (6) a shallow concrete pit at this point, approximately 18 inches deep, is also desirable.

The wheel spot arrangement has been found to decrease both labor and time required for this type of work and has also been found advantageous for performing any other work requiring jacking at this point.

Another improvement in freight-car running repairs can be made by making a careful inspection of all cars placed on the repair track for one defect so that all other necessary work can be performed to insure that it will not be necessary to set it out at some other repair point in the near future.

Efficient Handling of

Freight-Car Repairs

P. A. Helm

By P. A. Helm*

Second Prize Winner

Classification of cars for running repairs and specialization of gangs effects more intensive use of fewer tools and tends to improve the quality of workmanship at car repair points

THE American railroads in 1941 handled more tons of freight more miles with less locomotives and cars than during the prosperous times following World War I, and while we railroad men can feel elated we can look to the future and particularly this year as the time when this achievement must be surpassed. To do this it will require that our motive power and rolling stock must be maintained serviceable to a higher degree of availability than ever before. This can and will be done. The key is efficient scheduling of the work and proper classification of it as much in advance as it is possible to contemplate.

The key to efficient repair and reconditioning forces for rolling stock is the proper classifying of the equipment as it arrives in the classification or train yard. The yard forces should consist of sufficient competent equipment-department men for train and car inspection to make the necessary running repairs in order to prevent the removal of cars from the train and to properly classify the bad-order equipment taken therefrom; also to select the non-defective but non-serviceable freight equipment for placing on clean out or wash tracks in order that they can be put into serviceable conditions with a minimum delay. Defective equipment requiring only light repairs, (less than 15 man-hours per car) that is renewal of wheels, couplers, other miscellaneous light-repair jobs, should be classified so the operating department will place them for efficient repair-track operation. The cars requiring only light repairs should be grouped: (a) loads; (b) foreign equipment; (c) owned empties; and preferably located where sufficient repair tracks are available for separating the owned open-top and the closed cars. Owned cars requiring other than light repairs, that is, cars requiring classified repairs (more than 25 man-hours per car), should be separated and not placed on the light-repair tracks, but held available for placing according to instructions from the mechanical department.

Placing light repair cars in the manner outlined will permit the repair forces to be organized for class work. Each workman is usually better qualified to perform a particular class of work and this is usually the job that he likes best to do. By having the repair forces so organized, they are broken down into smaller groups or gangs for: (1) truck work; (2) air-brake work; (3) body repairs, including the work usually performed on the car from the floor up, including the roof, running boards, etc.; (4) steel gangs, which should be separated into sufficient men for removal of rivets, fitting up the parts and riveting; (5) painting and stenciling.

Utilize Fewer and More Efficient Tools

This organization permits the work to progress almost in the order outlined and with a considerably smaller quantity of more efficient tools, particularly air tools such as air drills, air hammers, etc. For example: one repair-track force prior to class work required 20 50-ton hand-operated car jacks for raising the ends of loaded cars; by classifying the work in order that certain gangs would do practically all the car jacking, six air-operated jacks were sufficient. Even though the latter cost twice as much, since only one-third the number were required, the cost and the time of doing the job with the modern tools versus the hand-operated tools is less than one-third and the investment in the tools is considerably less.

This is also true with other tools. Consider a light repair force of 40 men, grouped in approximately equal gangs under the old method of repair work, with each gang doing all the work on the car to be repaired with the exception of the air-brake repair work, painting and stenciling. The repair forces will require 18 pneumatic hammers, 18 pneumatic drills for wood or steel work, 8 rivet-heating forges, etc., with all of the usual tools

* Assistant car foreman, New York Central, Ashtabula, Ohio.

required by such workmen, and each of the tools will be used less than two hours a day. With the progressive or class-work system, this same force doing even a larger volume of work requires only three pneumatic hammers, six drills, three rivet heating forges and all other tools in proportion, but all of the tools are used almost the entire 8-hour day. Yes, the tools will wear out sooner, but with a smaller stock new and modern tools may be purchased more frequently and workmen always do better work with new and modern tools.

Unit Fabrication of Individual Car Parts Recommended

When building new cars, or rebuilding old cars, it is the common practice in an efficiently operated shop or on repair tracks to fabricate all steel parts; completely mill all lumber; and then process or assemble all of the parts possible into jigs, forms, etc., assembling these into as large a unit of parts as possible to deliver to the assembly tracks where erection facilities are available such as overhead or portable cranes. The same practice should be followed at repair tracks or in shops doing light repairs or classified repairs, particularly where a large number of owned cars are being repaired. This procedure permits the use of compression riveters, portable and stationary electric welders for the assembly of such steel car parts as steel side doors, the attaching of brake-beam safety straps and bottom-rod supports to truck spring planks, end and side ladders, and all other parts which can be applied as a unit. These parts can then be replaced as a unit, it being more efficient and economical to replace such parts as a unit in preference to endeavoring to repair them at the car. For such parts, repaired in a fabricating or assembly shop, the cost or the time of repairs is considerably less. In numerous cases, it is found that the cost or time of doing the work in this manner is less than one-half that of doing the work at the car. For example: driving rivets at the car with an air hammer, compared with driving rivets with a compression riveter at the assembly or fabricating shop, is usually twice, and sometimes three times as great in cost or time. Then too, when such work is so assembled, it permits a more efficient use of tools and promotes better workmanship.

Electric or gasoline crane trucks and rubber-tired trailers are an essential factor in the handling of materials, in the changing of wheels and in the application of couplers and heavy draft gears.

Roller Racks Facilitate Material Handling

The use of modern roller racks or ball race tables with the vertical power punches, vertical drill presses, and wherever they can be used to advantage, is recommended for handling materials between the machines and between the machine and assembly benches as well as for unloading of material from cars. Roller racks, properly placed, will permit two men to unload various classes of repair parts from a car into storage piles 10 to 15 yards distant and eliminate the tiresome trucking, doing the work in numerous cases in from 30 to 40 per cent of the total time required for trucking. Records will show that two men can pass large quantities of car decking from storage piles to the cut-off saw, moving from 90 to 120 ft. over a roller rack properly placed, in less time than required by four men when handling by trucks or otherwise.

A ball-race table attached to a vertical power punch will permit one operator to handle plates for punching even though some of the plates may weigh up to 600 lb. and will enable the one operator to push this plate around with ease and obviate the necessity for a helper. Any vertical power punch with at least a 24-in. deep throat should be equipped with a small duplicator table which will eliminate the laying out of parts, particularly plate punching, especially when there are ten or more identical pieces to punch. This will enable one operator to work efficiently and again obviate the necessity for a layout man and for any additional help.

New facilities and tools for repair work have developed rapidly in the past few years and a test of some will surprise the man who has not tried them and who has failed to change his old practices. A portable gasoline driven electric welder will surely surprise the man who uses it to weld holes in the side or end sheets or in the roof sheets of all-steel cars; or who uses it to put a patch or splice in a side or end sheet on either open-top or house cars; or to apply a shim to a coupler carrier iron, A. A. R. Rule 20, without removing the coupler; or to weld a corner or side stake on a steel car. In most cases, the cost or the time for doing the job with the modern portable electric welder is less than one-half the cost of using rivets or sending the parts to the blacksmith shop for repairs.

Using pneumatic hammers with especially designed cutting chisels makes the splicing of inside lining on box cars possible, permitting the repairman to renew one-half or one-quarter of the board in lieu of the whole board or several boards usually renewed.

Box cars contaminated with oil or grease spots, after ordinary sweeping and cleaning, can have such spots covered with an approved sealer applied with spray or brush, and the car can be retained in a Class A condition for high class commodity loading without the removal of large parts of the lining, flooring, etc.

Straight-Line Method for Classified Repairs

For classified repairs, by all means keep the cars moving down one track where the shop or repair track is equipped with double-end tracks, doing the work in a progressive manner. The best results are obtained by working them in special lots or classes, but this does not mean that it is necessary to accumulate large numbers of cars in order to have a special lot or class of cars before doing the work. For example: when 500 cars are to be repaired (five types of 100 each) they can be handled by grouping them into ten groups of 50 each, or even twenty groups of 25 each. It is not necessary to accumulate the entire 150 of each type before the work progresses on each lot. Here, by all means process all parts and assemble them into as large a unit as possible. The cost or time involved will be considerably less and better workmanship is obtained.

Where sandblasting cannot be used efficiently on some classes of cars, a high-speed rotary-type air or electric motor with circular wire brushes will prove advantageous and economical in the removal of rust and scale from the exterior preparatory to painting.

Painting should be done with a low-pressure air-operated paint spray, using the quick-drying or two-coat-a-day paint. By the use of the low-pressure type of paint spray the painting of the cars can progress on the same track as other repair work.

Plan Ahead for Materials

To repair cars and locomotive we must, of course, have materials, and today we must contemplate our requirements for such as far in advance as possible. Our stores and purchasing departments must be given a reasonable time to secure the materials to meet our requirements. Some of our standard materials, which we are accustomed to use, cannot now be obtained because of the national defense requirements and sub-

stitutes will unquestionably have to be used. A closer cooperation of the mechanical, stores and purchasing departments will be necessary.

Railroad transportation is a national defense necessity. It is doing a fine job efficiently. Efficient mechanical-department operation is a transportation necessity and we must insist on the replacement of all worn-out and obsolete facilities, equipment and machinery, even though they may be difficult to purchase. When the mechanical department requires a new machine, tool or facility, it can easily be proven to the management, who will be pleased to assist them in securing it. Previous timidity and reluctance on the part of mechanical-department officers must be set aside in asking for the replacement of such or the acquiring of additional facilities that will permit the work to be handled more efficiently. When acquiring a new tool or facility, the important factor is to arrange the work so as to keep it in constant use. A daily requirement for driving 6,000 rivets would permit the job to be done with five pneumatic hammers, driving 1,200 rivets each, providing the work is properly classified. Improper classification of the work may require ten hammers driving 600 rivets each. In the latter case, each tool would be working only a portion of the day. A factor to remember is that a three-hundred-dollar tool, working eight hours per day, is far more economical and efficient than a one-hundred-dollar tool working two hours per day. A more efficient tool, even at a higher cost, is always more economical if the work is arranged to get the full benefit of it.

Bad-Order Equipment Percentages Must Be Further Reduced

The time has arrived when new cars and locomotives can be secured only in limited quantities and this supply may get smaller. The American railroads in December, 1941, had fewer cars and locomotives in an unserviceable condition, in proportion to the total ownership, than ever before, but now is the time to keep every locomotive and car in a serviceable condition every day. When cars are cut out of commercial service due to bad floors, sides or roofs and the cars require classified repairs, quite a few of them can be temporarily conditioned for some restricted company service at a nominal cost. Every such car used releases another that is serviceable for commercial service. Then too, this same equipment will be ready for classified repairs when the materials and the forces are available. In this way, therefore, we lose the use of the car only during the time it is actually in the process of repairs.

Proper classification of car repair work must be the direct responsibility of the man in charge, and his immediate supervisors must accept the responsibility of directing and completing the work as scheduled. For efficient operation, the man in charge and his immediate supervisors must have the good will of the entire working organization. High-class workmanship and efficiency is the result of labor by men who enjoy their jobs, and the workman who enjoys his job will advance ideas, if asked by his immediate supervisor, as to how the job can be made easier, safer or how it can be done more quickly. Most contented workmen will usually respond in a manner that will lead to improvement. After all, is not the workman of today the supervisor of tomorrow?

National-defense production must increase considerably, but it can do so only to the extent that the mechanical-department men of the American railroads keep pace with the requirements for motive power and rolling stock. Our answer must be: "We will do our job."

* * *

Release the Full

Potentialities of the Men

These contributions deal with the delicate problems of human relations — They all affect that important but intangible quality of an organization's morale

HERE are a series of contributions related, in most part at least, to the great contribution in increased production that may be secured by a better understanding and handling of the human element in the organization. This section is in fact a distinct challenge for better leadership.

Some of the contributors are men in the ranks, and because they are so sincerely interested in winning the war they are quite frank and to the point in their statements. It would be well to read this section with a view to utilizing a vital factor in the problem of securing more efficient and greater production.

What a delicate thing this matter of morale is! How easily it can be discouraged and destroyed! How easily also it can be developed into something live and dynamic, if it is properly understood!

After all we Americans, under the skin, are intensely patriotic—*when we stop to think.* Also we are fighters and idealists. Thank God that under stress we do know how to fight together, shoulder to shoulder. But this must necessarily be predicated on a high type of morale.

When you have read this section and while you are still pondering over it, turn back to the stories in the first three issues of this year of those mechanical department leaders whose careers and personalities are there depicted. Is it not true that their success as executives is largely due to the fact that they appreciate keenly the human values in their organizations?

Man Is More Important Than the Machine

Suggestions as to how man-power may be used more effectively

By S. W. Selden,

R. F. & P., Richmond, Va.

The American railroads are faced with one of the greatest problems in their existence. The demand for transportation is, or will be in the coming months, greater than at any time in the history of railroading. Along with this demand there exists a shortage of skilled manpower, new and improved machine tools are almost unobtainable, and adequate additional power and equipment seem to be out of the question. Since there seems to be little hope of adding to existing facilities, it remains for management to attempt to improve the efficiency of maintenance and operation of present equipment.

Many railroads, forced by the depression of the thirties, have already made tremendous strides in conservation of material and manpower; but further drastic steps must be taken.

Modern warfare is based upon movement, and nothing could defeat our nation so quickly as a confused and snarled transportation system. The railroads must go "all out" to help win the war.

One fact has tended to become obscured in the development of the modern machine age; that is, the man is always more important than the machine. No machine or plant can be any better than the human intelligence and skill that devised and operates it.

Placement of Workers

The best way to produce more with existing facilities is to pay more attention to the man behind the machine. Railroads have too long operated on a laissez-faire system when it comes to the utilization of manpower. Many men are obvious misfits in the jobs they hold, yet very little attempt has been made to find the round holes for the round men, the square holes for the four-cornered men.

Greater Specialization

This is the day of specialization. We have learned that a man can be trained to do one thing with far more accuracy, speed, and efficiency than he can do a number of different and sometimes unrelated operations. It is entirely possible that the railroads could learn a great deal from the automotive industry. Surely, the unit system, or assembly-line method, which automobile manufacturers have found so profitable, could be adapted for the back shop of any large railroad. The average hardshell railroad man will dismiss this suggestion as impractical, citing the huge weight of locomotive parts, etc., but the automobile manufacturers have already refuted this argument by turning out on their assembly lines tanks as large as locomotives.

Many man-hours are lost every day by mechanics or helpers making trips to the storeroom for material. Some system whereby material could be delivered to, or placed on the job, should be worked out. The particular method would depend on the size of the shop, volume of work handled, etc.

Intensify Inspection

With the greater demand for utilization of locomotives and cars, there is apt to be a relaxation of inspection, the idea being to keep power and equipment rolling as much as possible. This is a mistaken policy. A single undetected defect could cause a serious failure which would undo many months' economy. We can ill afford to take chances on "tying up the road." Inspection should, if anything, be intensified.

When locomotives and cars are shopped for minor repairs, it will often save time to make the periodical tests and inspections, even though they may not be due at the moment. If time can be saved in the long run, what does it matter if a locomotive is given, say, a yearly test after only eleven months of service? The long-range viewpoint is needed. We must not get our noses so close to the grindstone that we can't see what we are doing.

Enginehouse a Bottleneck

The roundhouse often represents a bottleneck in locomotive utilization. A check of the normal roundhouse routine might result in the telescoping of many operations, thereby reducing the time locomotives are unavailable. Unfortunately, too often management is reluctant to disturb the "status quo." It is afraid to make any drastic changes for fear of upsetting normal routine. However, progress is achieved only by doing this very thing. The man who says "It can't be done," is nearly always wrong. These are difficult times and sweeping changes will be necessary if we wish to survive.

Throw Wasteful Practices Overboard

The railroads will come through with flying colors only if they realize this necessity for closer integration and organization, only if they do not hesitate to throw overboard the old wasteful practices that have seeped in through the years. Red tape must be cut. Operations must be simplified and standardized. Authority must be more concentrated. "Laissez-faire-ism" must go. In its place, the railroads must substitute intelligent planning, a more complete utilization of its manpower, and a correspondingly greater output from its existing plant.

To this end, it behooves management to survey its present practices and facilities. It is not enough to grope along "the best we can." Shops and men as well as trains must be stream-lined.

The Workers Pledge Co-operation

Must do our best to out-produce, out-fight, and out-wit the enemy

By A. J. Cochran*,

President, Federated Shop Crafts, Chesapeake & Ohio, Clifton Forge, Va.

Today, as never before, there is a crying need for greater co-operation in the railroad industry, as well as all other lines of activity. We have all been suddenly taken from a condition of severe depression to that of an all-out effort on the part of America to keep the Torch of Liberty brightly burning in a dark world.

We will have to unite our efforts to successfully overthrow the enemies of Democracy. To do this we need and must have greater co-operation between management and employees; co-operation between one department and another, both of foremen and men; co-operation between foreman and men in their respective departments, and, in general, co-operation from the presidents of the various railroads down to and including the humblest laborer.

Pooling Suggestions

I am a strong believer of suggestions and exchange of ideas between foremen and men or duly elected representatives of the men. The man who knows it all does not exist today; therefore we can learn a great deal by carefully considering the other fellow's ideas or suggestions.

I have just closed out a business that I personally operated for 10½ years and had employees who offered suggestions which proved very successful in my own business. The man who operates the machine has a greater knowledge of the potential possibilities of that machine than does the foreman in many, many cases. Likewise the man at the bench can discover more ways of saving time as well as material than the man in the office.

The foreman should not resent the suggestions from the operator of the machine or work bench, as is so often the case. There are many other jobs, and in all departments, where employees can offer very beneficial suggestions but hesitate to do so because of resentment of foremen shown when suggestions are offered.

As the duly elected representative of the Federated Shop Crafts in my shop, I wish to say our entire committee has pledged itself to co-operate in every honorable way possible to assist our master mechanic, general foreman and other foremen in getting the best results obtainable during this great emergency. This pledge we mean to keep.

We realize that there is a shortage of mechanics; therefore we urge our men to work every hour (both straight time and overtime) possible. It matters not how good a mechanic may be, he is of no value when laying off; therefore we are urging regular work, greater interest in our respective jobs, and above all helpful suggestions that will make for greater production and output during this grave emergency. We are determined to do our part and covet the co-operation of every foreman and man in our entire shop and throughout our great railroad system.

1942 Record Must Better That of 1941

Our master mechanic and general foreman tell us that our division made the best showing of any division on our railroad last year. We are very proud of this record but will not be satisfied until we know that the 1942

* A machinist with more than a quarter-century experience in railroad work.

record has far surpassed our good record of 1941.

Careful planning and sober thinking made America great. Let's keep her great by more careful planning and more sober thinking than ever before. The B. & O. slogan of 20 years ago, was then (when I worked for them) and is yet, mighty good concerning material. "Material to wear out, but none to rust out." The American workers say to the foes of Democracy, we will *outproduce* you, we will back our boys in the service to *outfight* you, and we will all unite with our government to *outwit* you and bring you to defeat, by the Grace of God.

Express Appreciation for Good Work

Will do wonders in bringing up production—Frank statement from an apprentice

By R. T. Milburn,
Ft. Worth, Texas

As far as time is concerned, I am a rank new-comer to the railroad industry. Only two short years ago I started serving my time as a machinist's apprentice. Regardless of my inexperience and age, though, I feel that I am old and experienced enough to know when a job is being done right and when it isn't.

During my time as an apprentice never have any of my superior officers ever come to me and patted me on the back and told me that I was doing a good job. Instead it has always been rank criticism on their part. I am just an average young man trying to make good, I know, but sometimes even the poorest of us makes an effort, which, if it were recognized and complimented, would give us an incentive to work and try harder.

I am not speaking for myself, alone; practically every man with whom I have an acquaintance on my particular railroad has had the same experience I have had with the foremen and the higher officers.

Now, the railroads, and every other industry for that matter, are faced with the task of getting the most out of what they have on hand. How are they going to do it, is the question? We have sufficient men and equipment in our shops to turn out more than 30 per cent more work than we are now. Since it is now a question of patriotism, we can and will do our part toward national defense.

Railroads have long demanded courtesy on the part of their employees. The managements should look behind their own door before they try to make their employees do something that they are not shown by their management.

I worked in my shops for more than six months before I knew what the master mechanic looked like. Above all the rest of the foremen, that man alone, should meet each new man personally and tell him what he is doing there and how much the company is depending on him to do his part. Let the man feel that he has a place in the business, an important place.

Should each man be treated personally with respect and consideration that is demanded of him, he would be a good man to have around. His enthusiasm for his company would go outside with him and reach other than just his immediate family.

It seems that the foremen think they are better than the men that work for them, that they are too good to associate with a man who wears overalls, when they, themselves, before they were given that little bit of authority wore them themselves.

My plan to increase production with what we have is simply to let the man higher up treat the man below him just as he likes to have his superiors treat him. If this is practiced by each and every man in the shops, regardless of rank, creed or color, the railroads will not have to wonder how they are going to increase production; they will see it being increased.

Leadership and Education

Truly they are invaluable tools

By Harry C. Fletcher,
Boston & Albany, West Springfield, Mass.

Leadership and education are the tools which will produce the quickest results, the most satisfactory results, the most enduring and the most economical results. Super-power leadership will haul more traffic than super-power locomotives. Leadership will reduce friction in our department as roller bearings reduce friction in our equipment.

With leadership carrying the load, a definite force will haul a greater tonnage, or the same tonnage will be hauled with considerably less effort. Leadership lightens the load by dividing and sharing its problems. Leadership recognizes its responsibilities and does its best to solve its problems before blaming the stores department, the operating department, the railway supply industry, and everyone but itself.

Leadership reproduces itself. It builds men to succeed itself and often builds a product better than the original.

Leadership improves production, for men respond to

its contagion. Good men will do their best and others will do better than formerly.

When we think of mechanical department education we visualize an apprentice training program. A program such as the "Report on Apprenticeship" presented before the last convention of the Locomotive Maintenance Officers' Association. This report published in the October issue of the *Railway Mechanical Engineer* should be read by all mechanical department supervisors, and if the report is entered in this contest the committee on apprenticeship will be awarded the first prize.

After apprenticeship, what? Education and more education, especially education for leadership. Graduate apprentices and others who are potential leaders should be encouraged to continue their education along these lines.

Railway supply representatives furnish the majority of the supervisors with their technical education. (Why make the apprentice attend school on his own time when the supervisor gets his education on the company's time? This may be an important question, or is it?)

Gang leaders should be required to complete some course in foremanship before being considered for positions as supervisors. They assume the responsibility of spending thousands of dollars of the company's money and it is of more importance that they appreciate and understand the efficient direction of millions of dollars' worth of man-power.

It is doubtful if there is any "best" course in leadership and the results will vary with the personal reaction of the student. All are better than none, and many are excellent. To mention one book, not because of its excellence but because of its popularity, I have never heard of a supervisor being any less efficient because of his having read Dale Carnegie's "How to Win Friends and Influence People."

Leadership and education are the two most effective tools capable of producing the solution of the mechanical department's present and future problems.

How to Stimulate to Greater Individual Effort

A number of devices to build closer and more intelligent co-operation

By Walter Cress,

Clerk, Car Department, Peoria & Eastern, Urbana, Ill.

The crisis which confronts us today may well be considered the turning point in American economic affairs, and how the railroads meet this crisis may definitely decide the future, not only of the railroads themselves, but it may well mean the success or failure of our entire economic structure. The solution of the railroads' problems rests primarily upon the personnel, upon the men who plan, who direct, and who perform the myriad tasks so necessary to the successful operation of this complex industry.

Building Up Production

Production in the past two decades has increased enormously through the medium of improved equipment, improved working conditions and facilities, improved organization, piece work, etc. Piece work alone, at points where it is used, has speeded up production by furnishing an active incentive to produce, and by instilling in the employee the desire for efficiency and production. Where properly supervised, without impairment of the quality of work, piece work should be extended to more shop and repair facilities.

Where piece work is not feasible, a check up should be made of supervision, since many in a supervisory capacity have gotten into a rut, and through favoritism, laxity in discipline and negligence have tended to reduce production.

Eliminate Saboteurs

In recent months another and yet more dangerous enemy of production has crept into the railroad industry. I refer to the growing trend toward radicalism in labor organizations, partly through precept and example of organizations in other industries, and partly perhaps from a concerted plan. Radicals, agitators, etc., have cropped out in the otherwise peaceful relations between labor and the managements of the railroads. Growing dissatisfaction and unrest is becoming more and more noticeable, fanned and fostered by these obnoxious trouble-makers. Petty grievances, growing ever more numerous, unless reduced or eliminated, are potential sources of real trouble, and certain curtailment of production. These agitators and radicals should be weeded out so that the average railroadman, who is fundamentally a pretty fair sort of a fellow may resume the even tenor of his existence. For a satisfied workman is an asset, while a dissatisfied workman is a liability. A little investigation should prove conclusively who the trouble-makers are, and after they are weeded out a unified plan should be developed to draw the personnel into a solid group, working for the industry and for themselves.

Suggestions for Improving Cooperation

The need for cooperation is now greater than ever before, and in the light of increasing seriousness of conditions will continue to be our most crying need. There is not enough cooperation between employees, between officials, between departments, shops, or roads. The improvement of employee relationships between the motive power and rolling stock departments, between the mechanical departments and the operating departments, would have a tendency to increase production by decreasing delays in handling of and repairing equipment, tools and appliances, thereby resulting in increased efficiency. If a spirit of cooperation and friendly rivalry between departments, shops and roads could be instilled in the personnel, replacing the present feeling of jealousy and envy, much could be accomplished.

A suggested plan toward this end would include contests between shops, departments, repair points and roads, based on production. A plan of this nature could instill a spirit of employee cooperation and pride in shop, department or road, which could not fail to benefit all concerned. The road, shop or department having the best record of efficiency and production should be recognized and be given some sort of an award. This plan could be worked out, based on production or production increase, by units or by road or both, divided into groups

of equivalent personnel and comparable conditions, similar to the safety campaigns which have proved so effective in the reduction of accidents.

The elimination of the duplication of work in the clerical branch would increase the efficiency of the clerical forces, and enable them to handle the increasing demands brought about by the increase in business. A careful study should be made of the various reports, with the thought of eliminating all duplications.

The education of yard forces and agents, and the encouragement of co-operation between them and rolling stock employees in furnishing cars for commodity loading would greatly expedite the movement, handling and repairing of rolling stock. If the yard masters, yard conductors and agents would co-operate with the rolling stock departments, furnishing cars of proper class for specific lading, much unnecessary work would be saved in preparing cars for commodity loading, caused by using a better class of car than necessary.

In view of the growing scarcity of materials greater care should be exercised in the scrapping of materials; many items now thrown into the scrap could be reclaimed, built up or repaired.

All of the foregoing items deal with personnel alone; here are a few other suggestions:

Extending serviceable life of equipment by a more frequent application of paint and rust preventative.

Anticipate equipment needs, in lulls in business, and prepare for them.

Make a careful study of the relative abilities and aptitude of employees, the better to place men in positions where most efficient.

Arouse this Sleeping Giant

With some specific practical suggestions for so doing

By Sherrell Watson,

Topeka, Kan.

In our search for the means of speeding up our production let us turn to the place where the success or failure of any industrial enterprise centers—*the men who do the work.* The finest high-speed machinery even in unlimited amounts under ideal shop conditions cannot, unaided, supply the locomotives, the cars, and the equipment now so vitally necessary. However, even outmoded machinery and difficult material shortages will not keep the railroads from reaching their goal if every workman is inspired to apply himself to the utmost, made eager to not only do his work as usual, but do it better and faster, and is encouraged to use his ingenuity to make himself and tools with which he works do a more effective job.

Collectively speaking, in the ranks of the American railroad workman lie a potential giant which has only to be aroused; awakened to the fact that it is his family, his country, his friends, himself for which he is to put out this increased effort. The day that these workers are all brought to realize that the success of this whole campaign and the very lives of the valiant men under arms, in fact the preservation of our American way of life, may rest squarely on their shoulders production problems will automatically begin to disappear.

Bring Facts to the Men

Giants such as ours are not inspired by pretentious flag waving or flattering speeches, but simple down to earth campaigns of bringing the facts to the men will get results. Show these men where the work they do at the bench or lathe or forge helps form a finished machine that is to do the work which is now so very important. Show them that the better and the faster this work is done the safer are the homes and families of our country. Let each man know that his suggestions for improving his or other men's work will get attention. In fact, give men who produce worthwhile improvements published credit in bulletin form on boards throughout the shop; give them recognition from company officials and bonuses in proportion to the actual benefit derived from their ingenuity and application.

Waste of time and material can be controlled or even completely eliminated if and when it is plainly visible to the workmen that such conservation is essential to the success of our national struggle and he will be personally benefited. Not only effective economy of materials but also reclamation and substitution of materials should be induced. Here lies a rich field, for in their everyday tasks these men are working directly with this material and as a consequence have a rare opportunity to study and develop its more effective use.

Some Specific Suggestions

Let them know that they are not working alone, but that the "front office" is cooperating in every possible way to get the materials needed and that policies and motives of the companies are not selfish and prejudiced. Get the best available equipment into the hands of the men at the first possible moment, and repair and remodel their machines and tools. Give out all the information possible and start voluntary night classes to help them increase their production and at the same time decrease breakdowns and delays by correct speed and feed of machines, by correct sharpening of tools, proper lubrication of equipment and more extensive use of patterns and jigs. Convince them that their safety and well-being is important. Induce cooperation and friendliness between the men of different departments, tolerate off duty social gatherings in an effort to break down suspicion and misunderstanding between the workers themselves, or between workers and their supervisors.

Inaugurate a schedule of work out-put based on accurate figures showing what can and must be done by the whole shop. Break these figures down to determine the quota for each department and finally furnish each worker with the figures showing the production necessary from him. Drive home the fact to each man that his failure means slowing up the production process in the entire shop; but on the other hand, if he completes the work assigned he is speeding up the defense effort affecting our whole country. Work out efficient schedules for material as it passes through its various oper-

ations in the plant so that no delays are caused by congestion of work at one point and a scarcity of it at another. Let each man know that the material on which he expends increased effort will be handled with dispatch not only all the way through the shop, but until it ultimately reaches the place where it can become effective.

Promote Contests

Work up contests between shops of comparable size and facilities. Periodically inform the men of the progress being made by themselves and their opponents. Present individuals of the winning shops with badges, cards, or emblems to signify they are railroad workers interested enough in the welfare of their country to do their utmost for its defense.

Railroad officials can arouse and inspire these men by enlisting the aid of their foremen and supervisors who can in turn have confidential talks with the men explaining tactfully the gravity of the situation, the responsibility entrusted to the railroads and the urgency of speed. Circular letters to the men from well known and respected officials may be used to an advantage. A poster campaign in every shop emphasizing patriotism and cooperation will help perpetuate the challenge.

We realize that the fulfillment of what is advocated here is no simple undertaking, nor can it be accomplished overnight, but the magnitude of the results will justify and in fact compel intelligent and ceaseless effort from every individual or group that in any way affects the thinking or activity of the railroad workers.

Utilize Ingenuity of Workers More Fully

By Hugh Allen Thomson,

Indianapolis, Ind.

There is a wealth of ingenuity in the railroad shops which is seldom used or requested and which would be given gratuitously. This ingenuity is at the *bottom* of the railroad structure, in the workmen. The majority of those hundreds of thousands of workmen are frank, clever, skilled, and superior in devising and combining efforts and suggestions for improvements and savings of material in their individual sphere of work. The majority of workmen are red-blooded Americans who would be pleased to perform double duty in this manner and help in the present state of emergency for an all-out fight to victory.

A patriotic appeal or request may be given directly to the workmen by the management, which will explain to them that the railroad welcomes their intelligence and ingenuity as well as their labor; or some method of giving credit or recognition may be the answer to this.

A set-up similar to the Safety First organization of the railroads may be an ideal method to obtain, acknowledge, scrutinize, and pass judgment on the practicalness of each idea or suggestion received from each workman. The Safety First organization is operated from the *top* of the railroad structure and filters down through all the departments, seeking out and eliminating unsafe and hazardous conditions and practices that may jeopardize the safety of the employees and public.

Build Morale and Stimulate Co-operation

Stresses the value of slogans and suggestion boxes

By H. W. Stowell,

Albuquerque, N. Mex.

Previous efforts to improve morale have been rather half-hearted in the shops and roundhouses. In times past the master mechanic would call the boys together for a pep talk and they would sing one verse of "America." One cold night in the drop pit the boss passed cigars. These were obviously gestures to build up morale. The whole background of each individual has an effect on morale. It is built up by propaganda.

Working with the Men

Workers think they have but a small stake in the enterprise they are engaged in and no voice in management and laying down policies. Shop council meetings, where shop problems are freely discussed by workmen and officials, give workmen a sense of importance and make them feel that they have a real part in activities. Cooperation is the thing and radical union organizers find tough sledding "organizing" a plant where every man talks freely with the superintendent and where grievances are aired at regular council meetings. In such a shop the foremen are more apt to be found working with the men than bossing them. Unfortunately such conditions are not universal and were unknown 25 years ago. In this day when psychologists have investigated every activity of the human mind, one would suppose that this intangible factor in success (morale) would be blueprinted, but it is too elusive.

A Slogan Needed

In large undertakings it is necessary to have proven loyal supporters of the management at key points. These men should know their stuff! Born leaders have the gift of building up the morale of their men. The daily wage and inherent ambition of the workers causes them to do

their job well, but more than this is needed in emergency. What we are trying to do should be clearly established and given a slogan and a symbol. Germany has "Heil Hitler" and the well known sign. A suitable motto for the railroad shop is hard to find. It should ring true. Railroad slogans are already plentiful like "Friendliness is a Tradition," and "The Old Reliable." A really good one that will crystalize our aims and appeal to popular imagination may elude search. "Uncle wants his boats" is the excellent slogan of the Manitowoc shipbuilding company, on the Great Lakes.

The controlling factors of public opinion are not seen on the surface. Indifference and antagonism may be founded in some disagreeable background experience that cannot be traced. If the superintendent or master mechanic would write a letter, or even a form letter, to each employee occasionally, asking for suggestions to improve efficiency, etc., and apparently take the workman into his confidence, morale would be higher. He might also know something about the families and personal interests of the men and inquire about their children, etc., in passing through the shop.

Practical Value of Morale

The following story shows how morale upset an experiment arranged to test the effect of good and bad working conditions. One of the large electric companies wished to determine the effect of proper lighting on shop output. It selected four of its best girl workers for the test and let these pick out two more. They were told that some important test work was being done and for them to do the best they could on their customary job of assembling some tricky electric apparatus. The output under the best possible shop lighting conditions was noted, also the output under poor light and very poor light. To the surprise of all, every time conditions changed the output slightly increased. The explanation was that the morale of the group was high and they were making special effort to do the best they could.

Building up morale is a swift and sure way to increase output and one that has great possibilities for important results without introducing new systems or spending money. It is the state of mind of an organization, difficult to define, but concerns loyalty, cheerfulness, tenacity, initiative, and enthusiasm. It is an intangible factor about three times more important than working conditions or the supply of tools and material. Favorable working conditions, including proper food, shelter, and entertainment, improve this mysterious something that armies fight on and workers work on.

The problem of how to build up morale by propaganda is a problem in applied psychology, a subject that railroad shopmen and other people know little about. Men react to what they believe to be true. Any effective propaganda must hook up with the emotional opinions men already possess. Psychologists call an established set of beliefs a stereotype. Man has no true picture of the world in which he lives but an imaginary picture he constructs in his mind to please himself. In other words a stereotype is knowledge we think we have and on which we base our behavior. People have a tendency to cling to their established beliefs and opinions and the effective propagandist takes this into account and directs his barrage of propaganda to arouse some attitude already dominant in the group.

Before 1922 the railroads did not pay much attention to influencing public opinion, or employees opinion either, and probably the best known railroad slogan was the remark, ascribed to Wm. H. Vanderbilt's: "The public be damned," which would not have been known except for newspaper publicity. Union propaganda had cost the railroads a lot of money and some counter-propaganda was necessary to build up a loyal organization. The company union was a good answer to union propaganda. Some examples of large scale propaganda are in order. The long range campaign of the public utilities companies is a well known example. These companies gave books to the schools, invited student groups to visit their plants and spread all sorts of veiled propaganda against public ownership of utilities. It was even suggested that the word "profit" not be used in connection with their business because "in the true sense public utilities make no profit." It worked and the United States is about the only large country where the utilities are not government operated.

More About Slogans

"Slogans are both exciting and comforting, but they are also powerful opiates for the conscience. Some of mankind's most terrible misdeeds have been committed under the spell of certain magic words or phrases." (J. B. Conant, Baccalaureate address, Harvard, '34). The word means literally "army call" and was the war cry of a Scotch Highland clan. "Keep 'em rolling to keep 'em flying" would not be bad for railroaders.

We need the help of magic words and phrases to help us over the tough spot in which we find ourselves. We do not know the magnitude of the task ahead but it will be greater than any previously undertaken. Glittering generalities like "Make the world safe for democracy" will not fill the bill. Too often we have been misled and found out too late that "it" was all a fake.

Now for a few suggestions that will help morale in the shop: The workman's name and occupation should be placed on a good sized, carefully framed, sign over his machine or bench. This not only helps everyone to know who is who but appeals to the worker's pride and even influences the quantity and quality of his work. The term "common laborer" or "common helper" should not be used. Nobody likes to be common.

Use a Suggestion Box

A suggestion box should be placed near the time clock where written ideas for improving shop practice may be presented direct to the master mechanic or superintendent in writing. If adopted, ideas presented in this manner should be paid for. This suggestion box method has been thoroughly tried out by large factories and it works. Even if no valuable suggestions are received it will interest the employee in his job and will help the management to know what is going on by indirectly presenting information that could be obtained in no other way. General Electric Company paid $1200 for one suggestion from an employee and another worker had 54 suggestions out of 78 put in actual use. An insubordinate employee was responsible for General Electric's suggestion box. He put a gadget on a machine during the boss' absence and was fired for it. Later he explained the merits of his invention to the boss' boss and was reinstated and the suggestion box was placed in the shop.

Here is a typical example of an employee suggestion that was a time saver in the railroad shop: A large furnace was being used to melt the lead from scrap driving wheels (an important reclamation operation at this time). The lead ran into molds placed in the bottom of the furnace and it was customary to make one melt each day and then let the whole furnace cool over night before entering it and removing the lead. An employee suggested turning a water hose in the hot furnace to cool it in a hurry. The large amount of heat absorbed by the water in flashing to steam cooled the lead in a jiffy and

it was possible to make four melts a day instead of one, thus increasing the output of the furnace and making more lead available when needed in a hurry. The man that did this said he got the idea from a book, Steaming Up, and that tells the story of Samuel B. Vauclain of the Baldwin Locomotive Works. In his early days Mr. Vauclain was asked to reline an annealing furnace in a hurry. He did it by cooling down the hot furnace with a water hose. Here is a suggestion within a suggestion that suggests that many good shop kinks are embalmed in the printed word and by reading the trade journals and literature of various trades ideas will be found that will be time savers in a new synthesis.

The suggestion box will improve morale because it appeals to the worker's pride and increases his interest because he sees that his cooperation and ideas are wanted.

Suggestions from Employees

Ideas can be developed and drawn out by the proper approach

By Robert H. Carlson,

Minneapolis, Minn.

For this supreme effort there is no panacea. No individual, board or committee, regardless of rank or training, could properly attempt a solution of all problems peculiar to this task envolving the utmost increase in efficiency during a period of restriction and elimination of many things heretofore deemed essential to the successful operation of a railroad. It will require a wholehearted coordination of the abilities and ingenuities of the entire personnel, from the chief executive to the laborer.

In arranging a program of approach to this problem, let us consider as the greatest untapped potential source of informative ideas and practical information, the employees of this great industry, particularly those in or related to the mechanical department—not that they are smarter than their officers, but there are so many more of them. They are in more intimate contact with and are using the equipment, appliances and supplies. Most of them have accumulated years of experience in their respective departments and individual duties, which should particularly adapt them for this effort.

The executive, regardless of his practical knowledge, cannot through personal observation be aware of all details relative to individual units or operations within his jurisdiction. His time is almost entirely devoted to administrative duties and such occasional inspection tours as time will permit. The junior officer likewise loses that intimate contact, as his supervisory duties are broadened.

If, however, each employee could make one practical suggestion effecting a short cut in operations, a saving in materials, supplies or operating costs, or an improvement in the service, the aggregate result would be astonishing.

Of course, such 100 per cent results cannot be attained, due to duplication of ideas, lack of ingenuity and, in some instances, lack of interest. Yet an approach that offers to the employee a means of cooperation in this emergency, without the complications incidental to participation in open meeting discussions, complex letter writing or asking supervisors to convey his ideas to higher authorities, should be acceptable to all and effect the utmost response and enthusiasm.

Why Suggestion Plans Fail

The methods of the past in such campaigns were usually none too fruitful, due in part to reluctance of employee to attempt individually anything that might cause him personal embarrassment, regardless of the merit of his endeavors.

Requests for suggestions from employees were usually more or less routine and alike, sometimes dressed up a little different, but to the man in overalls the same old thing, nevertheless. In fact, most "Boomers" soon learned just what to expect in that direction wherever they worked—usually "bulletins" asking cooperation, welcoming suggestions or announcing meetings wherein employees could offer suggestions, et cetera.

The reception and effectiveness of this approach has usually been of doubtful value to either employer or employee. The seasoned officer or supervisor often has a very tepid personal reaction to this procedure, yet it looks well and indicates to superior officers an effort in the right direction. It is usually soon forgotten, until another campaign is deemed necessary.

Many of the most able and efficient workers in and related to the mechanical department would rather labor in overalls than attempt the composition of a letter that could properly describe improvements or economies that might come to their attention. Likewise, if called upon at a meeting, they would be mute, not because they were dumb or ignorant, but for lack of experience in things that are not a part of their usual vocation. Neither do they relish an approach to busy officers who might be impatient or difficult to see. So, regardless of good intent, it is usually easier to do nothing about it, and thus ideas which may have much merit if applied in practice are lost, unless the employee can persuade his supervisor to handle the matter for him. Often a supervisor is likewise afflicted, as he is but a step above his subordinates. He too may dislike staff meetings and therein be mute, or evade writing letters that vary from routine correspondence and which perhaps might include somewhat complex sketches or descriptions. So what seems to the executive a simple, reasonable and friendly request, may be to the employee, a "headache," if he attempts such cooperation.

The message or correspondence from the executive finds its way to the employees without difficulty, but delivering the response, is to many employees, an overwhelming task, due to complications not apparent to the officer.

Employees Will Respond

But there is a solution. Employees will respond if a real desire for their cooperation is sought, and the executive, preferably of highest rank, who is best able to enforce such mandates, will establish a fair and effective system of rules for collection of such data and an impartial and reasonable method for elimination of the impractical.

The employee who submits such material should be

privileged to know the eventual disposition of his contribution, and if merited, some appreciation should be indicated by a written acknowledgment and an insertion in personal record files, if such are maintained.

If the suggested improvement is complex or particularly related to such employee's duties or working equipment, he should be consulted in the application thereof, inasmuch as there is possibility of distortion in the transmission of ideas, that could affect the practicability and effectiveness of such improvement.

The executive and engineering staffs, normally, almost exclusively initiate and apply such changes or improvements as are deemed essential for economy or better service, this being their obligation and past results speak well for their efforts. It is assumed that this group will continue, as in the past, to devote every effort toward that end. Having engineers, draftsmen and necessary facilities available to them, together with well established sources of information and many agencies for exchange of modern ideas, it will properly be their responsibility to appraise or revise and arrange for prompt application of material accepted as essential in this emergency.

The plan suggested is somewhat a reversal of the standardized procedure wherein the executive indicates a willingness to receive suggestions and the employee must assume the entire initiative in reciprocation.

Suggested Procedure

The executive inaugurating such program should expect without reservation the full, friendly and continuous cooperation of all subordinate officers and supervisors, in the assemblage of such data and the furtherance of this campaign. Every employee should be considered a prospective participant in this effort.

It should be the duty of the supervisor to seek by personal contact, the cooperation of the more reticent or too modest employee.

If local conditions indicate that better results might be achieved through efforts of a committee selected by employees to work in harmony with officers to that end, such committee should be afforded every essential assistance.

Make it a live, interesting and educational, patriotic service!

A standard printed or mimeographed form should be available to employees for description of the contribution, with provision for necessary accompanying data, such as name, occupation and location, also name of officer receiving it.

The employee should receive an acknowledgment from the officer accepting it.

All concerned should avoid preparation or acceptance of material reflecting adversely on other employees, or such as could be construed as unethical or derogatory to this effort.

Information that would merit general application for maximum utility should be available to all carriers. It is suggested that some active agency be established for this purpose.

Promote Safety

Suggestions to promote safety are of utmost importance to the mechanical department, inasmuch as trained and skilled workers are difficult to replace and an injury to an employee may seriously hamper operations.

Speed with safety should be the aim.

Elimination of waste can be accomplished with a general improvement in related operations and much saving in time and expense. It should be a pleasant effort.

Utilize American Inventiveness

Proposes that best practices from local suggestion boxes be pooled by all railroads

By John F. Todd,

Machinist, C. & O., Lexington, Ky.

Many years ago, when I was a youngster at the trade, an older machinist told me this: "If you would show an English machinist how to do a certain job, then come back to that shop twenty years later, you will find him doing it just as you told him. But if you told an American machinist how to do a certain job he would try to improve on it the next day." That is characteristic of the American people in general, and the American machinist in particular. We are an inventive people, we are constantly striving to do things better than they were before. This applies to the railroad mechanic more than anyone else. Not one of us but has at one time or another made up gadgets and jigs to lighten manual labor and simplify complicated processes in the building and repair of locomotives and cars. We see that a thing should be done a better way and we proceed to find out that way.

But it is more often true than not that this inventiveness on the part of mechanics is used only locally, each one's idea of betterment in shop practice not going beyond the local shop. In this national emergency when such a heavy burden rests on the rolling stock of the railroads we need all of our skill and ingenuity to keep the big machines going. The daily mileage of locomotives has increased greatly in the last several months and will increase more in the months to come. In servicing this power more care and watchfulness will be needed on the part of running-repair men. This is the time to pool our brains and inventiveness for the use, not only locally, but for the benefit of all railroads.

I would suggest that it could be done this way. Let each employee be urged to make suggestions to the management of each shop or plant of better ways and methods in upkeep and repair of locomotives and cars. There are many ways in which running-repair men and mechanics generally can find savings in material and labor, as well as improved methods in the upkeep of locomotives. Then the suggested improvements could be passed on to the chief mechanical officer of the railroad, there to be examined in consultation with mechan-

ics who have had years of experience and skill, able to judge of the practicability of the idea suggested. They could then be sent out to all the shops on the road. Of course what could be used to advantage in a small shop might not suit in a larger one, and vice versa. But out of the many suggestions some at least would be useful in most shops and roundhouses. The important thing is to keep locomotives going.

Also there should be a central bureau where these improvement ideas could be sent from each railroad and from this place made available for use on all the roads of the country. I would suggest that some publication devoted to the interests of mechanics on the railroads would be the proper agency to act as a central bureau. If you've got a good thing let others know about it in this time of National Defense.

The Supervisor's Responsibility

The men will respond better if they understand the "why"

By C. E. Fairburn,

Gang Foreman, C. & O., Huntington, W. Va.

One of our Class I Railroad presidents complimented the officers and men for a job well-done in handling the greatest amount of business in one month in the history of that railroad. This accomplishment was only possible through the splendid co-operation between the workmen and management.

This is not enough. Each day that passes, material and man-hours are less, and harder to get. This places the responsibility squarely upon the shoulders of supervision. They must throw off the shackles of revenge, selfishness, or indifference, and work as one unit to save material and man-hours.

The supervisors, wherever they may be, in back shop, roundhouse, or store department, must work closer together to accomplish this task. The workmen must be taught to use only the material that is actually needed for the job and not new material where it is possible to repair or salvage the old parts; and to take care of machines, tools, or equipment entrusted to him.

It is said that a foreman must be a diplomat; he must be tactful. Men do not respond and give their best efforts when simply receiving curt orders. They want to know why they must do things in a different way from that to which they have been accustomed. They like to know the reason for changed plans or new methods. If they understand what you want, they will take a much keener interest in their job, will do a better day's work and will be happier than if they are just mechanically doing their part in a series of operations. The mind of man working alone has accomplished many marvelous achievements, but the minds and hearts of many, working in harmony with one another for the mutual benefit of all, have a wealth of power that can be a valuable asset to any organization.

Build Up the Morale

Encourage suggestions from employees; use forums and discussion groups

By H. H. Andresen,

Draftsman, C. B. & Q., Chicago, Ill.

To meet today's war time production demands upon railroad car and locomotive shops a certain intangible force is of supreme importance. That force is the morale, spirit and enthusiasm of the railroad shop's personnel. Despite the importance and indispensability of railroad service to agriculture, industry, and commerce, and because of the inroads upon the railroads' field of service by trucks, buses, pipe lines, waterways and aeroplanes, and the foreboding prediction regarding the future of the railroads constantly appearing in newspapers and magazines, many railroad employees have become discouraged and disheartened; they have come to feel that railroads are a sick and dying institution and as a result the morale, spirit and enthusiasm of railroad employees is steadily declining.

Nothing will more speedily and effectively increase the overall productivity of railroad car and locomotive shops than the reversal of this decline and the raising of the morale of the railroad shop employees. To accomplish this two suggestions are offered.

Install Employee Suggestion Plan

Install an employee suggestion plan, through which employees may submit suggestions for the improvement of production and maintenance methods, materials, and the railroad's service to the public.

Suggestions should be submitted anonymously, identified only by a prescribed duplicate numbered form which must accompany each suggestion. A portion of the form bearing the duplicate number is retained by the author of the suggestion as a means of identification if his suggestion is accepted.

Suggestions should be considered by a qualified and alert committee, and appropriate cash awards granted to the author of acceptable suggestions.

The employee suggestion plan affords an excellent opportunity for constructive participation in the affairs of the employing railroad and instills loyalty, interest, and enthusiasm.

Appoint a qualified and able person to promote em-

ployee forums or discussion group meetings to be held periodically, preferably bi-weekly, to debate, study and discuss the many phases of railroad service and its influence upon all people. These discussions might include the railroad's place in the sphere of economics; the advantages and disadvantages and future outlook of the various forms of transportation (railroads, trucks, buses, waterways, pipe lines and air-lines); railroads and the American standard of living; railroads from the investor's viewpoint; railroad securities as insurance company investments; the St. Lawrence Seaway; railroad progress and further possibilities of improving railroad passenger and freight service.

Lectures and explanatory literature are of limited value as a means of interesting and acquainting railroad employees with the economic aspect of the various forms of present-day transportation service, but a thorough knowledge of the principles of transportation and the ability to transmit this information to relatives, friends, neighbors and business acquaintances may readily be acquired through participation in the informal debates and discussions of railroad employees.

Fundamental Desire for Recognition

It crops out in or lies just below the surface in many of the following comments

The simple but profound desire of all men for human recognition has been evident at many points in the papers which have been presented in full or in abstract. Much the same urge is evident directly or indirectly in some of the following short paragraphs. Some of them also raise pertinent questions with respect to problems of supervision and of shop or enginehouse organization and management.

Training Courses for Mechanics

The government has placed at the disposal of the citizens vocational schools, trade schools, and classes where there are competent instructors. All this is free of charge, and I feel the average railroad shop and engine house mechanic would receive a great deal of benefit for himself and the railroads if they would enroll in one of these schools. I would suggest taking shop mathematics; this knowledge will help them to solve many problems.—*William J. Panek, Machinist, C. St. P. M. & O. Ry., St. Paul, Minnesota*

A Call to Arms

In the present emergency all railroad workers are morally called to support the front line fighting men; to support those who, if necessary, are willing to defend our birthright with their very lives; to support those who have set an example that we must give an "all out effort" to keep up with them. . . . A successful American defense depends upon the individual attitude of all railroad workers. The railway men are called to sharpen an ax toward the climax of the axis.—*Clyde Cahill, Oelwein, Iowa.*

Don't Get the Itch from Criticism

Supervisors in the shops, watch your stripping gangs. We must save and reclaim every piece of material possible. Don't get the itch from criticism,—welcome it. And don't know so much that the laborer cannot point out things to you, for your good as well as the management. Success is sometimes obtained from being a good listener. Don't take all the credit for the pointers given you. Let it be known that "Bill" picked up so and so and passed it on to you. Then other "Bills" will be doing the same for you. Your job will be easier. You will be a success and your company will get the saving. It's all so easy when you have co-operation, and co-operation depends on the supervisors. Another thing, Supervisors, watch the tools the men are working with. Get rid of your old wornout tools. If you give your men good tools to work with, you can demand good efficient work. Wornout tools are a waste of output and when you are not getting the proper output you are wasting money. In the world of dwindling resources —know the value of materials and use them masterfully, neither skimping nor wasting. Personal discipline is the guide to success.—*O. N. Monroe, Car Foreman, Atlantic Coast Line, Rocky Mount, N. C.*

"That Was a Nice Job, Fella"

It's inconceivable how much human relationship is being ignored by both supervisor and laborer because the laborer is driven instead of being induced; there is no one who will say to him, "nice job," or "I like the way you did that" Instead the boss takes on a do-more-next-time attitude, never thinking of the prestige he undoubtedly would have gained had he shown a little appreciation. In my thirteen years of railroading I have only once known of a case where the boss has said to his mechanic, "That was a nice job, fella." I took particular notice of this mechanic to see the results, and believe me when I tell you he certainly did come through with flying colors. The Mechanical Department is on the spot only in that one person is waiting for the other one to co-operate, instead of co-operating himself.—*Clifford F. Connors, Conneaut, Ohio.*

Less Walking and More Work

We should make a change in our method of performing ordinary repairs. First let us understand the ordinary routine of a job. The gang leader gives the machinist a slip noting the repairs to be made. With his helper the man goes to the locomotive with his kit of tools and sizes up the work to be done. In more than forty per cent of the cases all that is necessary is to tighten up a part or apply a standard nut or bolt. The helper starts out for this part, first seeking the foreman to get an order, then he hikes for the storeroom, awaiting his turn, and after considerable time returns to the waiting mechanic. There could easily be arranged between various pits in the enginehouse small supply centers containing nuts, bolts, washers, cotters, etc., and other small supplies generally used that a man may take without the usual long drawn out procedure.—*R. T. Roberts, Albany, N. Y.*

Share Ideas

One big field for improving shop production has hardly been scratched and this is due to the clannishness of the individual railroads. Each railroad and, in some cases, each shop has its own little group of inventors who are always devising new methods and have new ideas on improving the method of handling or improving the equipment itself. Within the individual railroad, master mechanics, general foremen and various shop foremen should be interchanged between shops from time to time to bring in new ideas and keep the supervisory staff alert. Neighboring railroads should contact each other from time to time, and, if possible, make visits and exchange ideas. Competition is the spice of life; but with so much outside competition, the railroads should cling together and lend each other a helping hand as far as possible.—*Eugene W. Preble, Alexandria, Va.*

Mobilize Brain and Ingenuity

A bureau should be established to deal with mechanical problems in the railroad field and its personnel should be recruited from men who have demonstrated their ability to initiate new ideas and to develop and apply the ideas of others. No division of any railroad is without one or more of such men. A group of practical men, selected with care, could accomplish much in developing labor-saving devices and improved methods of performing work. Railroads have not scratched the surface of the potential wealth they now possess in the undeveloped ideas of their employees.—*H. W. Payne, San Bernardino, Calif.*

Up-Grading Shop Employees

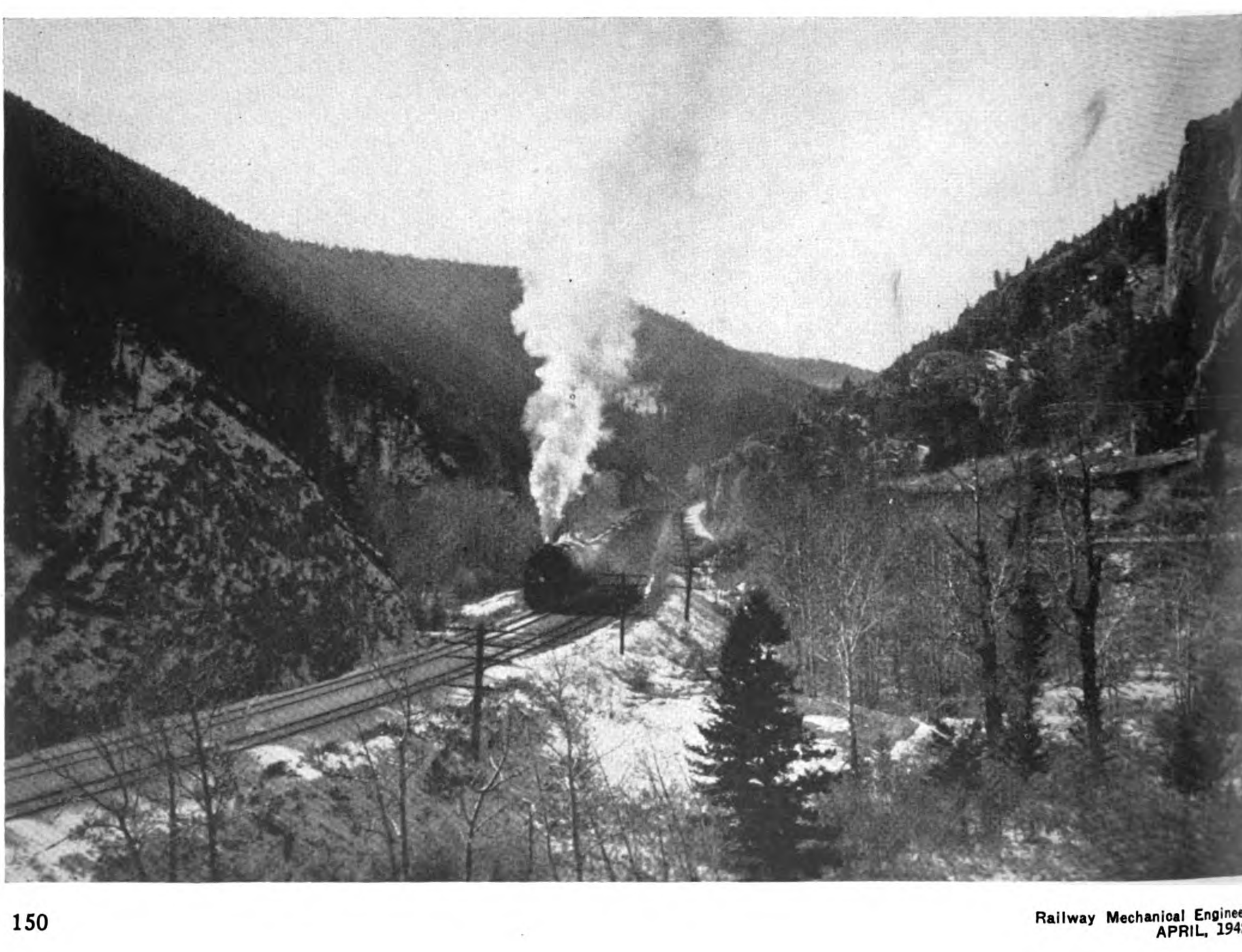
The question of labor shortages is most acute because other industries have already employed many of the finished apprentices at more lucrative salaries than those offered by the railroads.

There are many shops who have several young and intelligent helpers on their rosters. As a proposal, perhaps the companies could arrange with the labor organizations, to which most of the men belong, whereby outstanding helpers could be temporarily promoted during the emergency. After the emergency, the men can return to their original status without loss of seniority or standing. It would seem the men involved would welcome the opportunity to earn more money for the duration without running the chance of losing their status afterwards if offered a permanent promotion. Also, outstanding three-year apprentices could be promoted with the understanding their journeyman's card would be revoked if they left the employ of the railroad during the emergency, but if released through no fault of theirs, such as by a reduction in force, their promotions would become permanent.—*L. H. Booth, assistant mechanical inspector, Chesapeake & Ohio, Richmond, Va.*

How Many Men Per Foremen?

Authorities say that a foreman cannot do his job with the greatest efficiency if he has more than twenty-five men to supervise. He must devote a reasonable part of his time to planning his work for best results. Where too much time is required to supervise, planning will necessarily be neglected.—*W. L. Loving, car foreman, Spokane, Portland & Seattle, Vancouver, Wash.*

* * *



More Intensive

Use of Car-Repair Facilities

Work shops 24 hours and bring more work under cover — Can the multiple-wear steel wheel be improved?

In addition to the second prize article, there were six entries in the competition which deal with various aspects of car performance or car repairs. One of the writers presents in detail his argument in favor of a change in the flange thickness of the multiple-wear wrought-steel wheels. Another thinks that three-trick operation of car-repair shops would effect a definite improvement in the efficiency of freight-car operation partly by bringing indoors a considerable amount of work now done on the outside repair tracks where neither the quality of the work nor the effective use of man hours can compare with that obtained inside. There is also one short, but pertinent comment on the problem of dealing with hot boxes. A thoughtful consideration of the questions asked by one entrant may well lead to the smoothing up of the rough spots in more than one organization.

Multiple and Two-Wear Wrought Steel Wheels

Service life may be extended by increasing the original flange thickness 7/32 in.*

By J. B. Roman,

Pattern Supervisor, Chesapeake & Ohio, Richmond, Va.

It is common knowledge among railroad men that the cost of wheels for rolling stock, coupled with the labor of handling them, is one of the greatest if not the greatest item of expense to be carried by the railroads in the field of equipment and material. Therefore if some saving could be derived on each wheel that is placed in service or a great proportion of them, considering the large number of wheels which must be replaced each year or originally applied to new equipment, the resultant economy would be a substantial amount.

At the present time several types of wheels are used, cast iron, cast steel which are classed as one-wear and multiple-wear, and wrought steel which are classed as one-wear, two-wear and multiple-wear. Each type and class of wheel has certain specific and inherent good qualities which are the factors upon which their selection is based. These qualities at present balance each other so neatly that it has not been definitely proved that one type should be universally used and the remainder eliminated. Thus the railroads are confronted with the task of improving an individual type or class, perhaps taking a satisfactory quality found in one class and transferring it to another.

From a study of wheel service, it has been found that flange wear is a paramount cause of multiple-wear wrought-steel wheel removal. The multiple-wear and two-wear wrought-steel wheels have a flange thickness of 1 5/32 in. when new and a condemning limit of 15/16 in. thickness, a thickness wear range of 7/32 in. The one-wear wrought steel wheel has a flange thickness of 1 3/8 in. when new and a condemning limit of 15/16 in., a condemning limit which is identical with the multiple-wear and two-wear wrought-steel wheels, a thickness wear-range of 7/16 in. or 14/32 in. Thus the one-wear wrought-steel wheel has a decided advantage for longer life in its usual one cycle of life due to the thicker flange which it has when new than the multiple-wear wrought-steel has in any one of the three to four cycles of wear during its life. The thickness of the flange wearing metal of the one-wear wrought-steel wheel is exactly double that of the multiple-wear and two-wear wrought-steel wheels, or 100 per cent greater, which is an obvious reason why the life cycle of the one-wear wrought steel wheel is considerably longer than any single cycle of wear of the multiple wear wrought-steel wheel.

Increased Flange Thickness Not Held After First Wear

In the above, the aim has been to bring out the fact that a thicker flange is advocated for the multiple and two-wear wrought steel wheels at their initial application, that is, the wheels should be rolled with a thicker flange when new so that they can be turned with the desired thicker flange. The point is now stressed that the thicker flange is desirable only at the original application of the wheels, as an attempt to hold to the thicker flange at first removal and throughout the life of the wheel would result in the waste or loss of service metal from the tread of the wheel when turning to restore the wheel contour. When the wheels require turning, the railroads should revert to the present standard flange and tread contour for multiple wear and two-wear wrought-steel wheels.

How will the design of the wheel change and what effect will this change have in mounting the wheels, are questions which naturally follow? As the wheels are

* This proposal is not new and has been considered by the A. A. R. Mechanical Division, Wheel Committee, on numerous occasions in the past. The possibility in some instances of turning one-wear wrought-steel wheels with increased flange thickness to the multiple-wear contour and thus securing further service life is mentioned in the 1941 report of the committee. Regardless of the practicability of Mr. Roman's suggestion, it is obvious that any attendant economies will not be immediately or quickly available.—Editor.

to be machined to the present standard contour at their first removal from under equipment, the least difficulty from all standpoints would result if the additional metal thickness were added to the wearing face of the flange; thus the present mounting gage would continue to be used for gaging the location of the wheels on the axle with the exception of the original application which would require that they be mounted to the inside gage limits plus 1/8 in. in a manner similar to mounting wrought-steel wheels with worn flanges. As it would be necessary to depend entirely on the inside legs of the present gage in mounting, it is rcommended that a new mounting gage be used for the thicker flange, as it is justified by the economy in view.

In turning the tread and flange contour for the original application, it is also recommended using the 3/4-in. throat radius as in the one-wear wrought-steel wheel

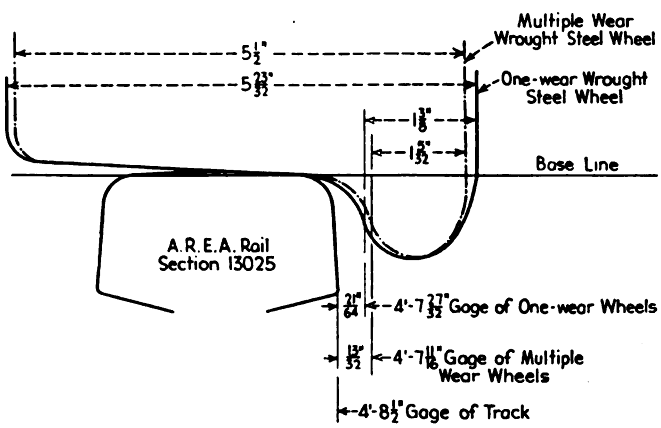


Fig. 1—Position of multiple-wear wrought steel and one-wear wrought steel wheels with standard contour mounted to standard gage on rail

instead of the 11/16-in. throat radius, as it has been noted in a study of flange wear that the ratio of flange wear to tread wear is greatly increased after the flange has only a few sixty-fourths of wear. This is due to the fact that the flange first wears almost purely from rolling friction on straight track which later develops into sliding friction as the throat radius becomes smaller

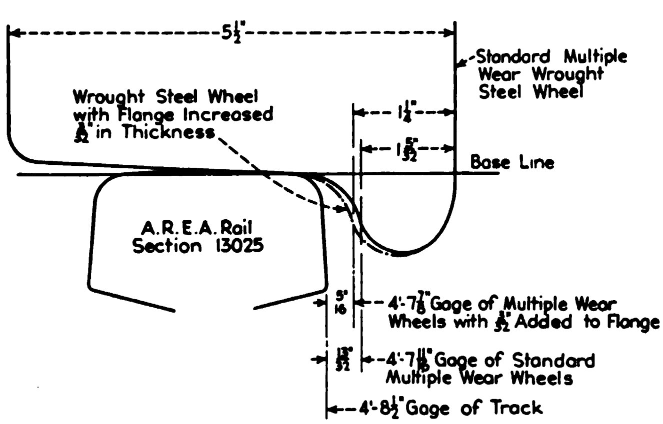


Fig. 2—Position on rail of standard multiple-wear wrought steel wheel mounted to gage and same wheel with 3/32-in. of metal added to face of flange

and the flange begins to rub against the rail instead of rolling over it. Therefore, the 3/4-in. radius being larger, rolling friction will exist for a longer period of time and greater life will be given the flange and consequently the tread wear and flange wear will have a better opportunity to balance each other.

In Fig. 1 is shown the position of a multiple-wear wrought-steel wheel and a one-wear wrought-steel wheel both with present standard contour on an A. R. E. A. rail, section 13025, when mounted to standard gage.

In Fig. 2 is shown the position on the rail of a multiple-wear wrought-steel wheel with present standard contour and a multiple-wear wrought-steel wheel with the flange increased 3/32 in. in thickness at the wearing face when mounted to inside standard gage. This makes the distance between the gaging points on the face of the flange just 1/32 in. greater than the 4 ft.-7 27/32 in.

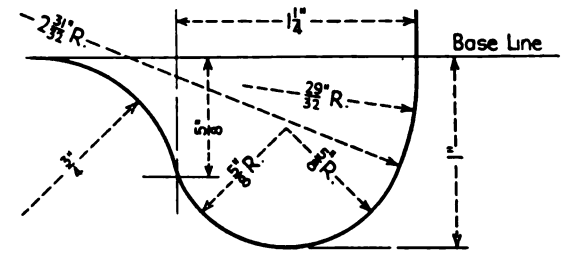


Fig. 3—Detail of flange increased 3/32 in. in thickness

distance now used for the one-wear wrought-steel wheel. This is the immediate change advocated in the flange thickness and it would not alter in any way the present relation of the multiple-wear wrought-steel wheel gaging when the railroads revert to the present wheel contour at the first turning. Fig. 3 shows the detail of the new flange contour. This does not call for much change in the manufacturer's rolling equipment.

Flange Thickness Increase of 7/32 In. Considered Most Desirable

To increase the multiple-wear wrought-steel wheel flange 7/32 in. in thickness to be equal to the flange thickness of the one-wear wrought-steel steel, and thus

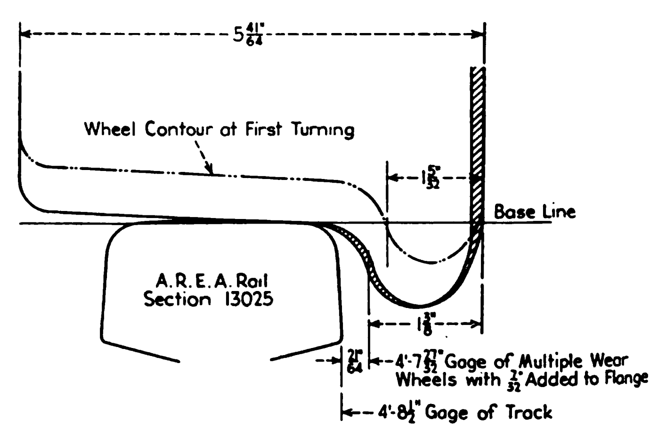


Fig. 4—Position on rail of multiple-wear wrought steel wheel with metal added to face of flange and back of flange and rim to obtain 7/32 in. increase in flange thickness

gain considerably more service in its initial cycle of life, involves more changes than the changes recommended above.

Taking a long view of the situation, with due consideration given to the change required in rolling equipment and the gaging of the wheels, it is the author's firm conviction that in the final analysis the 7/32-in. increase in flange thickness is the most desirable and will produce the greatest economical results. Above there was added 3/32 in. to the wearing face of the flange, but in order to get a total of 7/32 in. increase in flange thickness, it is recommended using the same flange contour as that now used for the one-wear wrought-steel wheel which will add 5/64 in. to the face of the flange of the standard multiple-wear wrought-steel wheel and 9/64 in. to the back of the flange and rim. The wheels are then originally mounted to gage with the present one-wear

wrought-steel wheel gage. After the first turning, it will be necessary to use a new mounting gage for gaging the mounting of the wheels with the flanges turned to the present standard contour.

In Fig. 4 is shown the metal added to the present multiple-wear wrought-steel wheel to obtain the 7/32-in. increase in flange thickness. Note that no metal is added to the front face of the wheel rim. Fig. 4 also shows the contour of the wheel after the first turning, reverting to the present multiple-wear wrought-steel wheel standard flange contour.

Studies of wheel service show that by increasing the life of the wrought-steel wheel flange the life of the wheel is prolonged considerably.

Ask Yourself These Questions

If you cannot answer them satisfactorily, is your car department in good shape?

By Milo Denney,

Interchange Car Inspector, Wabash, Tipton, Mich.

Are all departments working in perfect harmony for the good of the whole, or is each department pulling in a different direction?

Are the men of each craft doing their own work, or horning in on some other craft causing bad conditions and loss of efficiency?

Have you any make-believe car inspectors, who permit cars not fit for loading to be set in at loading docks, thus causing loss of confidence of shippers, expense to the carrier and loss of tonnage going to truck lines.

Is an insufficient number of car inspectors, or lack of proper inspection, especially to foreign equipment, resulting in many running repairs, delays, lost confidence of shippers—possibly heavy car repairs or even train wrecks?

Are foremen cutting off help, trying to impress management that they are extra efficient, and at the same time losing business and causing much additional expense by neglect of equipment?

Are foremen capable of understanding their men and placing them on jobs for which they are best suited, or do they show partiality, hold grudges and cause trouble which leads to labor-board cases?

Do loading-dock foremen at carriers' docks bill out cars carrying low tonnage and improperly loaded?

Are bad-order cars which have been set out repaired at once or are they delayed for days?

Have you sufficient trustworthy car inspectors to guard against any and all possible sabotage, as well as the usual running defects?

Do you always try to prove your point of view and are you always on guard against false economy?

Suggests Car-Repair Work on a 24-Hr. Basis

The author also points out the value of specialist instructors

By L. M. Foley,

Car Inspector, New York, Chicago & St. Louis, Erie, Pa.

May I suggest the advisability of placing our car repair shops on a 24-hr. basis, particularly during the fall and winter months. In nearly all of our American railroad repair yards, we find the shop holding from 16 to 80 cars, varying in size according to the needs and size of the railroads. In addition, we find outside repair yards holding from three to four times as many cars. Consequently considerable repair work has to be done outside in all kinds of weather and it stands to reason that no man can do as much work in freezing and raining weather as could be done under cover. Inasmuch as there will always be considerable light repair work on railroad cars that will have to be done outside, the placing of the shops on a 24-hr. basis which ordinarily are working on an 8-hr. basis, would bring inside a portion of the work done out in the open and I am sure that all car repairmen would rather work inside than outside at night.

If the car shops were placed on a 24-hr. basis it would require approximately one-third the number of tools commonly used by car repairmen. In addition, and possibly even more important, cars would be repaired more quickly, thus helping to relieve any possible car shortage.

A greater amount of work could be accomplished by the man working inside than is done out in the open, particularly in cold weather. Material could be moved to the men more easily; there would be less waste, particularly of lumber; material which is piled alongside of cars in the open yard in rain or snow is more liable to be broken than material under cover.

There is less time lost by men working inside than by the ones who are exposed to the changing winter weather. The car manufacturers who build railroad cars do all their work under cover and have even gone to the expense of renting buildings when the demand warrants it. They say they just cannot afford to build and repair cars outside in the open, so why wouldn't it pay the railroads equally as well to utilize the space that now stands idle 16 hours a day?

Specialists —Within Limits

The use of specialists in a certain line should never be tolerated to the extent that it interferes with the expansion of the work in that craft. Any man not doing a certain line of work in his craft for some time will naturally forget or become rusty. The ever-changing methods and the use of more improved mechanical devices necessitate special supervision in many cases. May I cite two cases where expert supervision has overcome this obstacle.

1. An eastern car manufacturer, building cars for the railroads, has men trained in car building to do nothing else but instruct shop men who do not seem to grasp the easiest and right way to do their work. I have seen men that were very green and clumsy become very good car builders in a short period of time through the efforts of these instructors.

2. I know of a railroad which had a large number of delays to trains a few years ago due to setting out cars which had developed hot boxes. The matter was placed in the hands of a competent man who had made a study of car lubrication. His contacts with all the car forces involved, instructing them as to the proper method of car lubrication and proper use of their tools, has gained for him an enviable record as a lubrication expert.

Other Suggestions

Standardization of Car Repairs Advocated

The standardization of both passenger and freight equipment is largely responsible for railroads of the United States weathering the last depression as well as they did. However, the policy of standardization has gone far enough. There are various kinds of shop facilities for repairing cars. Some are good and others are bad. It is my thought that one of the most practical and economical operations that could be installed on many railroads is a standard method of repairing cars both foreign and system. I am quite aware of the fact that my idea cannot be worked up over night. But it may well be said that rules and regulations of the Association of American Railroads governing repairing and interchanging of cars were not perfected and put into operation over night.—*A. D. Alvord, general car foreman, Illinois Central, New Orleans, La.*

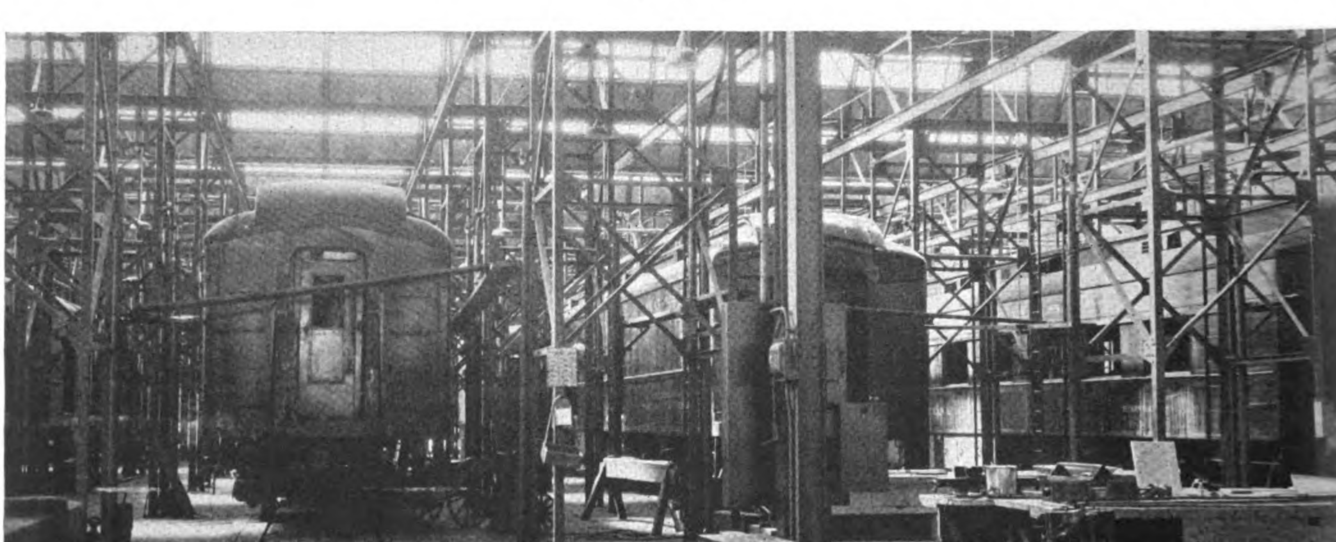
Pooling of Passenger Equipment Suggested

Another important item of railroading, in my opinion, is the handling and pooling of passenger equipment. Cars today are not like they were 20 years ago. Most passenger equipment operating on Class I railroads today are in good condition and do not become deteriorated and worn-out over night. The thought that I have in mind is that more consideration should be given to the pooling of passenger equipment. A check of railroad passenger terminal yards will reveal many lost passenger-car hours due to certain cars being assigned to certain passenger runs which, if properly supervised, could be pooled, and the passenger-car hours saved would be unbelievable. It is true that the handling of repairs and cleaning of passenger cars would have to be speeded up; however, every other item of transportation is being speeded up, and from my knowledge of handling passenger equipment, I know that an enormous amount of money could be saved if close supervision were given to the handling of passenger equipment.—*A. D. Alvord, general car foreman, Illinois Central, New Orleans, La.*

Hot Boxes A Great Cause of Delays

A check of delays to loaded cars indicates that hot boxes are the greatest cause and an investigation has shown that for an eight-month period on 74 per cent of all loaded cars set out for this cause the repack dates were 10 months old or less. Therefore, a system should be inaugurated, first, to see that boxes are properly packed with suitable packing and second, that packing is set up in every journal box on every outgoing car and boxes carefully examined to see there are no defective or spread journal-brass linings, which work should be done after switching has been completed and the cars are ready for train movement. This plan has been tried out with excellent success and if religiously followed will avoid many delays to loaded cars. It will save the tying up of cars for change of wheels due to cut journals and the labor and material expended for this work can be applied to other cars making them available for service without additional manpower or facilities.—*W. F. Crowder, car foreman, Pere Marquette, Muskegon, Mich.*

* * *



Factors Affecting

Locomotive Operation

A challenging question from a locomotive engineman—systematic analysis of engine failures—Some suggestions for facilitating successful locomotive performance on long runs

WHILE the number of contributions dealing directly with locomotive operation are not as numerous as those in some of the other sections in which the competition material has been classified, those received are by no means lacking in interest. Two of them deal directly with the duties of the enginemen. One of these, written by a locomotive engineman, makes a proposal which is a direct challenge to all enginemen. It would, no doubt, be dismissed by them without consideration if it had not been proposed by one from their own ranks.

The engine-failure paper which constitutes the major contribution in this group proposes a comprehensive set of methods for reporting, analyzing and correcting locomotive-part failures. While many of the suggestions are not new, some of them are sufficiently rare in their application to be worthy of most careful attention.

The paper on long runs contains suggestions pertaining to the servicing of locomotives at intermediate terminals which should be read along with Mr. Raymond's paper in the group dealing with the enginehouse; it is evident that the two authors are closely in agreement in their diagnosis of the problem.

How the Engineman Can Help

Demands fuel economy and proper handling—Periodically examine and demote unqualified men

By O. Edgar Allen*

To one who has witnessed the evolution of the railroad industry, it may seem absurd to suggest that further improvement in efficiency of operation may be made in the interest of national defense. To management upon whose shoulders rests the responsibility for such a condition, that suggestion might seem like the biased opinion of some uninformed crank. Yet the possibility does exist, and its value at this time, when the railroads are being called upon to perform even more than in the past, is great enough to warrant any effort.

Fuel Records A Guide

A most important item in the cost of any transportation is fuel for power. Steam is still the most used power on the rails and no machine is so dependent upon its operator for economical operation as the steam locomotive. It is possible for an engineman to get his train over the road day after day without loss of time and still waste fuel in almost unbelievable quantities. When all steam locomotives burned coal and were fired by hand inefficient operators were restricted somewhat by the limits to the ability of a man to shovel enough coal into the firebox. With stokers to handle the coal, or with oil burners, they may waste as much as they wish and the fireman will not complain.

Many enginemen now in service were hired many years ago. If they were required to pass any examination it dealt with the cruder machinery of that day. Some of these men have kept abreast of the development of the power they are operating. Others have not and are operating machines that cost as much as $125,000 about which they understand only the elementary facts. Economy, under the circumstances, is unlikely.

The same fireman worked on alternate days with two different engineers on a train which always had the same engine and the same number of passenger coaches. All conditions were practically identical. By counting the number of shovelsful of coal it was ascertained that one engineer consistently used four tons of coal more than the other in one round trip of 200 miles. Working twenty days per month this man wasted 80 tons of coal, assuming that the better man wasted none. There was no way of measuring the exact amount of wear that was unnecessarily caused by the less skillful man but it must have been in proportion.

Small Losses Add Up

Engines are being operated without proper lubrication and in a manner that reduces their mileage between overhauls tremendously. Unnecessary wear and damage is caused to draft rigging and brakes on cars. Unnecessary stops are being made for fuel and water. Needed minor repairs are being neglected to develop into major operations for the sake of paper records. In the aggregate, these leaks are destroying a tremendous amount of fuel, steel, brass and other materials, are increasing man-hours and are keeping rolling stock out of service and in the repair shop. The cure may only be accomplished by men who have an understanding of men along

* A locomotive engineman in active service.

with their mechanical knowledge. Although there is no panacea that would eliminate all these troubles, there is an individual treatment for each one that will produce results in time.

Periodic Tests for Engineers

This treatment can be administered only by one who understands something of the politics of railroad management and knows why the official responsible has not made the correction. His hands would be more or less tied if he were subordinate to any lesser individual than the superintendent of motive power, and it is possible to imagine situations where even that might be a drawback. He could proceed with this program only under the most favorable conditions.

Under these conditions, the efficiency man should require all engineers to pass an annual or bi-annual examination on machinery and air brakes. This examination should not be given by any official of the division upon which the men are working but preferably by the efficiency man himself, who will need to be fully qualified if he is to follow the remainder of this program. Any employee who does not pass the examination should be permitted a reasonable time to prepare himself and be given another test. If he fails the second time he should be removed from service and given one more chance to qualify. Failing the third time he should be removed from the service permanently or demoted. There is no reason for the railroads to continue to employ such a person in so important a capacity.

Upon ascertaining that all operators possess the theoretical knowledge necessary for skillful work, he should then observe how each one applies it and insist that perfection be achieved. No surgeon ever attained his skill with instruments from books, but rather from observing and from practice under competent direction. Some automobile mechanics are poor drivers, and some men, who know all about locomotive operation and train handling as it appears in the text books, have never learned the practical application of that knowledge. These must be taught the correct way in which to do their work and made to understand that only that way will be acceptable.

Enginehouse Must Cooperate

Each engineman is required to examine his locomotive after every trip and report its condition and the repairs needed. It is easy to understand why a man, who may have been on the road for sixteen hours and who may be cold, hungry, and wet to the skin, might fail to do as thorough a job of this inspection as he should. Sometimes his engine is so loaded with ice and snow that some parts are not visible. Any of these reasons might cause him to overlook defects which if not corrected before the unit is returned to service may result in very serious trouble. The enginehouse foreman should be required personally to inspect, or have a machinist inspect, all incoming locomotives and should be held responsible for the detection and correction of all defects which his equipment will permit. The practice of repairing only what the engineman reports may permit the foreman in some outlying enginehouse to make an excellent record so far as holding down costs in his shop are concerned, but it is an expensive one for the railroad. A slight addition to his force might make possible a large reduction in the one at the backshop where the things he has neglected are being repaired in their more developed condition. An additional material cost of a few hundred dollars might spoil the savings record of the enginehouse and actually save many times that amount for the company.

Without doubt the railroads are considering every possible means of increasing the facilities of their shops. Where new and better tools are available they will be installed. Every effort will be made to make needed repairs quickly and return equipment to service. However the railroad that applies the "ounce of prevention" will find it worth more than the "pound of cure." The one that concentrates much attention upon the elimination of man-failure, especially in its mechanical department, will produce surprising results in keeping its engines and cars rolling.

More Through Locomotive Runs Will Help

Kind of facilities and organization needed for servicing locomotives at intermediate terminals

By Kenneth B. DeCou and Jay DeCou

The physical characteristics of a railroad may be such that, after making a run of only moderate length, locomotives must be changed in order to use power fitted for the character of the work to be done. However, in many parts of the United States, railroads are not seriously confronted with this problem. At the same time many roads are stymied here because they have used limited foresight in preparing their rails, roadbeds, and bridges, where a little planning and small expenditure would remedy the situation.

It is common practice, in freight service, to operate turn-around runs, that is, to time the runs so that return tonnage will be immediately available when the engine reaches the end of the division. This method of operation is practically equivalent to a continuous run over two consecutive divisions.

The longer the run, the greater the need of careful inspection and maintaining the locomotive in first-class condition. This does not mean that the locomotive need be held at the terminals for a longer period of time between trips than when the runs are short; but it does mean that the inspection must be thorough, and that, to obtain the best results, equipment must be provided at terminals for making prompt repairs. The inspecting and servicing of locomotives on through runs is an individual problem that must be solved to fit each case. It will require a great deal of cooperation between the transportation and mechanical departments. The transportation department must consider the situation the shop forces are in and make all possible efforts to give reliable information as to the arrival and progress of all trains far in advance of present customary practice. They must, without reluctance, make all necessary changes in time cards to facilitate a better engine

handling. They should also cooperate with the mechanical departments in asking for such facilities as may be needed to improve any handling of extended locomotive runs. It is also necessary for the engine crews to be able to give reliable information as to the condition of the locomotive. The shop forces will have to have this information from the crews, far enough ahead of time, to cut in another engine if necessary. They must in all cases have advanced information on the conditions of incoming locomotives on through runs, so that they may arrange to have all the requisite tools, men, and equipment ready to make necessary repairs quickly and efficiently.

A plan could be devised wherein all normal servicing could be completed in thirty minutes time when ample arrangements are made for a turn-out spur, on a track used only for through trains; equipped with pit, fuel facilities, water facilities, sanding facilities, and instructions to leave the servicing crew undisturbed to perform their work. The crew might consist of one supervisor, two cellar packers, one man for fuel, water, and sand. For coal burners a fire cleaner would be added. Then of course the advance information from the engine crews will occasionally substantiate the presence of one or more mechanics of some one of the crafts, which will depend on the type of work that must be performed.

Equipment Serviceability Aided By Eliminating Failures

Thorough inspection and analysis of failures improve service—How to systematize the work

By H. P. Hass,

Engineer of Tests, New York, New Haven & Hartford

Because of the shocks and stresses to which steam locomotive parts are subjected in service and the ever increasing speeds and tonnage to still further augment them, it is necessary that everything possible be done to guard against failures. The extent to which we are successful in accomplishing this will have an important bearing upon (1) safety of operation, which comes before everything else; (2) performance, which requires that maximum availability and mileage be obtained from each and every locomotive; and (3) cost, in which are involved standards, methods, practices, material and labor.

Owing to the difficulty of purchasing auxiliaries, devices or equipment of any kind, the greatest use must be made of existing equipment and materials and their maximum efficiency developed with the two-fold object of conservation and the highest degree of reliability.

Design and material have, in general, become well standardized through the efforts of the A. A. R. Committees on Locomotive Construction and Specifications for Materials, and while such work is never completed, great progress has been made in recommending and adopting standards which, if currently carried out, will reduce the possibility of failure.

Inspection and maintenance have not been so well standardized, each road having its own plan of inspection and its own maintenance standards, methods and practices. Since inspection and maintenance play such an important role with respect to road failures, it is desirable that they receive a great deal of thought and study.

One plan of inspection which is unique is to place the inspectors in a separate organization entirely divorced from the maintenance organization and reporting directly to the head of the mechanical department. This is along the lines adopted by industrial companies and obviously has some very good points in its favor. Regardless of the plan, men for the important position of inspector should be very carefully selected and examined to determine how thoroughly they have learned their locomotives.

In order that inspection may be thorough and accurate, sufficient inspectors, well trained, organized and supervised, should be provided and adequate time for inspection permitted. At a busy engine terminal the supervision requires, before anything else, a prompt and accurate condition report of each locomotive so they may decide upon which engines to concentrate their efforts, so that every move may count.

Definite rules and regulations should be adopted for inspection and test at monthly, quarterly and recondition repairs of certain devices and parts which reports indicate are liable to failure or which are not accessible at daily inspection. A separate work report, including the daily work book report, should be used for these periodic inspections and a strict rule made that not less than a stipulated high percentage of the items of work reported shall be performed before the locomotive may be returned to service. This will result in a minimum of daily work items during the ensuing period and better general performance.

Supplementing the regular inspection reports should be those from the road foremen of engines respecting all items noted by them during the operation of the locomotive and which may not be obvious while at the terminal.

With respect to maintenance, the selection and training of the supervision is extremely important. The management should adopt the best possible standards, methods and practices and then much depends upon the ability and alertness of the supervision in knowing and rigidly adhering to them and training their men to perform their duties throughout in a workmanlike manner. It is impossible to over-estimate the value of training and this applies not only to the apprentices and men, but to foremen. The training of the latter in foremanship has been somewhat neglected in favor of production and there is considerable back work to be made up in this direction.

Studying the Problem of Failures

A study of the problem of failures will show that it resolves itself into three important phases: (1) kind and number of failures; (2) analysis; (3) remedial action.

Since the defects which may and do develop on a locomotive in service are almost unbelievable, we must first know the nature and extent of each kind of failure.

Form 1962-A-2

The New York, New Haven and Hartford Railroad Company

MECHANICAL DEPARTMENT

MASTER MECHANIC'S REPORT OF MOTIVE POWER FAILURES

NOTE:- This report shall be forwarded to the Gen. Mech. Supt. within 2 days after failure. Send a copy to the Master Mechanic, General Foreman and Foreman Mech. Inspector of Terminal from which locomotive was dispatched.

Dispatched from.. Date of report....................
Failure occurred at.. Date....................
Train No....................Time lost.................... Loco. No....................
Engineer....................Fireman.................... Gas Car No....................
Loco. maintained at.. Motor Car No....................

1. Failure of locomotive due to..
2. Cause of failure of part..
3. What specific details were checked to determine cause?..
4. What repairs were or will be made to part or device which failed?..
5. Who investigated this failure?....................Where?....................
6. Does the nature of the defect suggest we inspect other locomotives for the same condition?..
7. What effect, if any, did the failed part have on any related part?..
8. Was there evidence of any carelessness or neglect?..
9. What is the general condition of this locomotive?..
10. What recommendations have you in the way of design, material, maintenance or inspection to prevent a similar failure?..

....
Master Mechanic.

Fig. 1—Standard form for reporting locomotive failures

This information becomes available by adopting the rule that each and every defect which results in a delay to a train shall be investigated and reported upon by the master mechanic. Every possible effort should be made to determine the actual cause. Where there is an effect there must be a cause and on the extent to which inspection and maintenance forces are successful in discovering and treating the cause depends the ability to reduce failures to a minimum.

A standard form should be prepared for reporting

failures and be in the nature of a questionnaire, such as illustrated in Fig. 1. These reports should be thoroughly analyzed as soon as received and any clues or information contained therein used as the basis for systematic checks and investigations to prevent similar failures. The reports should also be currently tabulated by causes of failures so that at any time the extent of trouble may be known and an analysis made to determine whether due to design, material, inspection or maintenance.

The analysis of failures will, undoubtedly, indicate they fall largely into the following classifications: (1) cracked or broken parts; (2) lubrication and heating; (3) steam and leaks; (4) auxiliaries and devices; (5) miscellaneous.

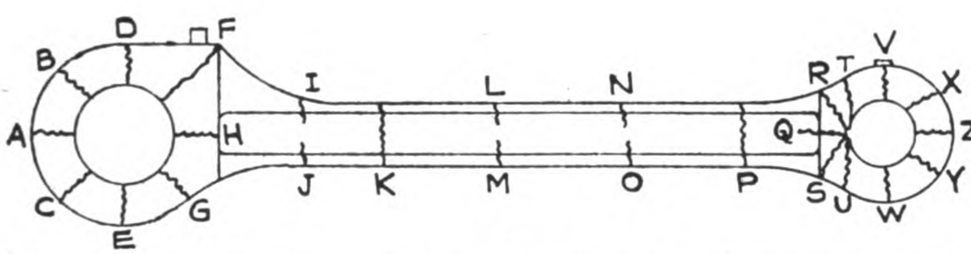
In discussing these classifications, suggestions or recommendations are made not because they are particularly new but on account of their importance. In fact, some of them are quite elementary and they are mentioned simply because failure to consider or constantly check them may very likely result in an increase in failures.

Cracked or Broken Parts

Cracked or broken parts are a continuous source of trouble and expense. In many cases a broken part may cause breakage or injury to related parts and in some instances may strip the entire side of an engine. To begin with, it is important to keep an accurate record of the nature and extent of defects and to accomplish this, standard report forms should be prepared and inspection or maintenance forces required to render a report each week. The form might be in the nature of a defective machinery sheet such as shown in Fig. 3, which has a sketch of each vital part so that it will be easy for the inspector to indicate where the defect existed and answer pertinent questions as to markings, location, size of break and the probable cause. Forms may be letter size and, as indicated, one sheet may, for example, include a sketch of all the vital parts of all the valve gears types on the railroad. The reports should be tabulated as received in the general office and summed up quarterly so that at the expiration of each quarter an analysis may be made.

New York, New Haven and Hartford R. R. Co.

RECORD OF FAILED MAIN RODS – SOLID BACK END



YEAR	LOCATION OF BREAKS																										
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	TOTAL
1938																											
1939																											
1940																											
1941																											
1942																											
1943																											
1944																											
1945																											
1946																											
1947																											
1948																											

Fig. 2—Annual summary of main-rod failures

Form 1990-Q

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY
MECHANICAL DEPARTMENT

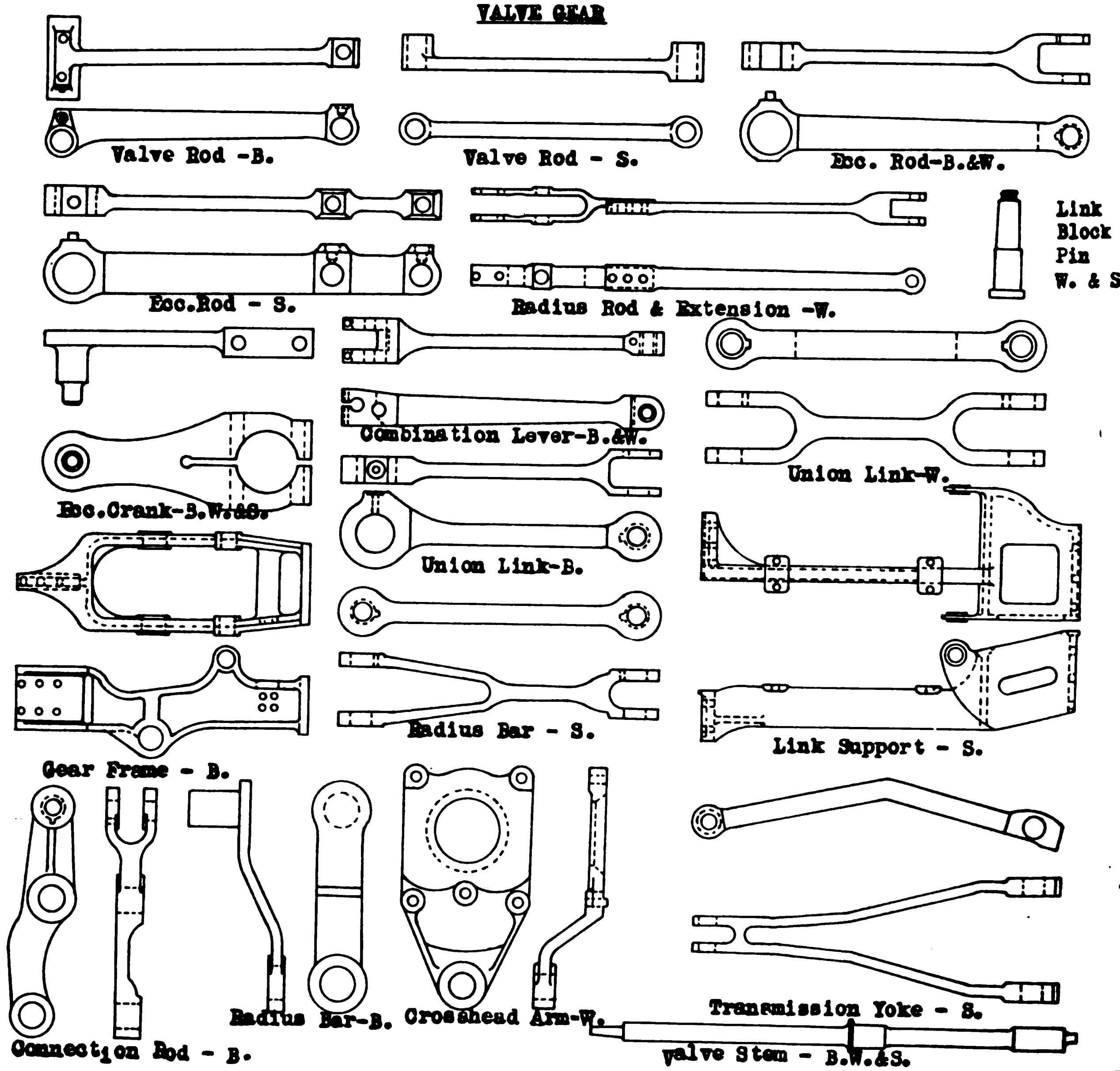
REPORT OF CRACKED OR BROKEN PARTS - STEAM LOCOMOTIVES

Location ______________________ Loco. No. ________
Name of Part ______________________ Position ________
Patt. No. __________ Drawing No. __________ Applied at __________ Date ________
Markings
Size of Material at Break __________ Size of Break ________
Cause of Break ______________________

Week Ending Thursday __________ ______________________
Signature

Note: Read Instructions on opposite side of this form.

VALVE GEAR



Note: (On reverse side of original form): This report shall be rendered each week. Include broken parts which caused a locomotive road failure. Report only one part on a sheet. Do not include parts broken as a result of the failure of another part. Do not include cracked welds. If break is welded for first time and part is to have further service, show by (W). If part is of old or new design, include this on report. In order that the exact location of the break may be determined dimensions shall be given from some definite point on the part to the break. Opposite cause of break, indicate whether it was poor fillet, tool marks, sharp edges, hammer marks or dents, chisel marks, torch marks, improper heating, poor welding, poor material, poor design.

Fig. 3—Sample form for reporting valve-gear defects

To assist in keeping a summary analysis of such parts as are most prone to failure and to provide pertinent information for the mechanical engineer, a form such as shown in Fig. 2, might be adopted.

It has been found that design and material are not generally the answer to cracked or broken parts. If such were the case, we would have a relatively easy solution of the problem. The actual causes are improper workmanship, mechanical abuse and poor maintenance. In other words, it is much more understandable to a design or materials engineer than to maintenance forces, from a laborer up, that steel, under dynamic stress, is like something alive and must be used and handled with great care.

It is apparent that a great deal of training of maintenance forces is required with respect to machining and handling of vital parts in order to provide proper fillets; eliminate tool marks, sharp edges and corners; prevent cuts, bruises, dents, torch marks; heating of parts to alter, straighten or align; cutting and welding. Ways to accomplish this are the use of lantern slide lectures at shops and terminals showing the effect of abuses; frequent photographic reports of ruined or broken parts, illustrated in Figs. 5 and 6, and prominently displayed; thoughts for reducing cracked or broken parts, shown in Fig. 4, and also prominently displayed in billpost form in the various shop departments from stripping to erection.

Each important part should have every inch of its surface thoroughly explored, using a magnetic tester each time the locomotive goes through the shop for general repairs and each time a part is removed at terminals. At these times it is advisable to recondition parts by removing, with proper stones and buffers, cuts, dents, bruises and gouges so that cracks may not develop therefrom. All time and effort expended in making close inspection and test and reconditioning will pay big dividends by preventing cracks as well as detecting them when in their initial stage so that their further progress may be prevented.

Attention should be given to stripping practices, the handling and transportation of parts to cleaning vats and to and from departments so that cuts, dents, bruises and torch marks may be kept at a minimum.

While the cutting torch is a valuable tool, it is capable of great damage in the hands of inexperienced men. Burning out bolts or bushings often results in gouging a part and starting a crack. Heating parts with a torch to straighten, align or alter its length should positively be prohibited because the flame, being at about 6,000 deg. F., may burn the steel or destroy its proper microstructure.

Preheating of parts prior to welding or building up and all welding practices should be studied. There is much promiscuous use of cutting and welding equipment and it may be advisable to keep such tools in the toolroom to be issued only upon orders of the foreman who should then follow up the use.

Careful consideration should be given to the necessity and extent of machining parts that have been cut out by oxygraph. The effect, and depth of the effect, on the steel is considerable and important parts will require machining and careful heat treatment.

NEW YORK, NEW HAVEN AND HARTFORD RAILROAD CO.

THOUGHTS FOR PREVENTING CRACKED OR BROKEN EQUIPMENT PARTS

1. **Stop rough machining and poor fillets: remove tool marks, sharp edges and corners.**
2. **Machine out prick-punch marks used in laying out work.**
3. **Apply markings with steel letters and figures at locations where no injury will be done.**
4. **Prevent cuts, bruises, dents and gouges. When they occur, remove with proper stones and buffers.**
5. **Use copper, lead or fibre hammers and sledges. If steel is necessary, use a copper sheet between.**
6. **Provide storage horses or rails for parts and cover the runways with wood, rubber or copper.**
7. **When lifting parts with a crane or hoist, use a hemp rope sling.**
8. **When removing parts from equipment, do not drop them on the floor or upon one another.**
9. **When transporting parts in trays to cleaning vat or Parts Department, separate them with wooden blocks.**
10. **Do not heat important parts with a torch to alter length, straighten or align.**

Fig. 4—Poster used in shops for calling attention to preventative measures

At general overhaul, valve-gear and other important parts which show indication of having been heated in an engine terminal to alter length or align, should be thoroughly inspected for cracks and then annealed or reheat treated, depending upon the original specifications.

In the category of improper maintenance may be mentioned poor fits and loose connections which greatly increase the shocks and stresses and general wear and tear of vital parts. Wrist, knuckle and valve-gear pins are chronic offenders in the wear column and being such important connections, perfect pin fits and tight fits of nuts on pins must be currently maintained and an effective method adopted to keep them tight.

To reduce the tendency of failure of axles, crank pins and piston rods, due to stress and corrosion fatigue, the fit should be very smoothly turned or preferably ground and the bore truly round.

The use of a collar on the piston-rod fit does not appear to be good practice. A stress-relief groove in

the neck of the crosshead appears to prevent failure of piston rods.

For tires, maintain wheel centers smooth and as nearly perfectly round as possible. The bore should have a glass-like finish and sharp edges be removed. Band steel should be used for shims where permitted and it is advisable to cut the ends on a bias.

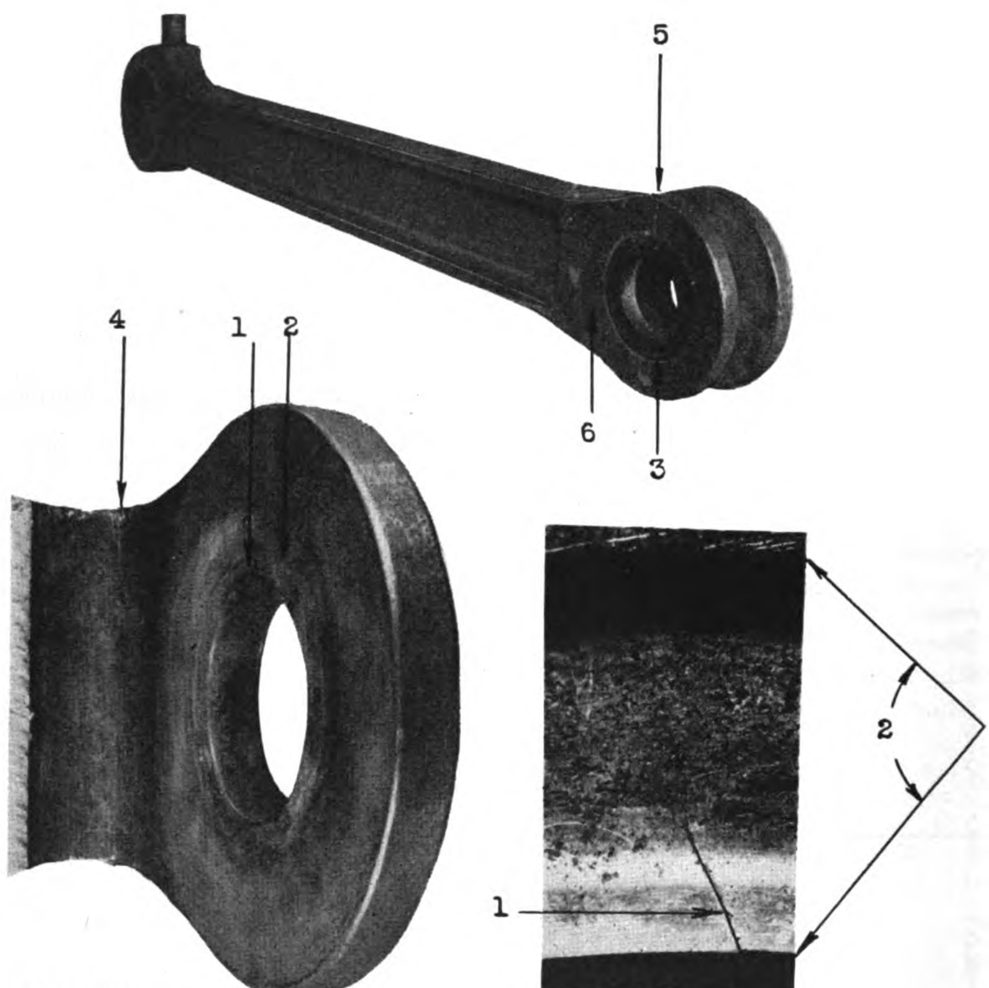
Remove sharp edges from the eyes of rods and from

New York, New Haven and Hartford R. R. Co.

PHOTOGRAPHIC REPORT

CRACKED AND BROKEN STEAM LOCOMOTIVE PARTS

SIDE ROD - LOCO. 1391



A. Cause of Failure.
   1. Crack caused by sharp edge worn at knuckle pin fit.

B. Reasons for Wear.
   2. Wear from contact with knuckle pin bushing.
   3. Loose knuckle pin as indicated by recess made from contact with washer.

C. Additional Defects.
   4. Tool marks.
   5. Sledge marks.
   6. Markings in improper location - See Loco. Folio Sheet No. 23-1.

D. Recommendations.
   7. Knuckle pins to be maintained tight at all times.
   8. Edges of knuckle pin fit to be rounded off whenever necessary.

Fig. 5—Photographic report of rod crack caused by sharp edge

knuckle-pin holes as they develop; also from grease and spud holes.

Remove sharp edges from wrist-pin holes in crosshead as they develop; also from keyways.

At the larger terminals assign men to the maintenance and setting of shoes and wedges.

To avoid cracks in engine-truck and trailer-wheel hubs, especially the former, due to hub heat, white metal might be used on the box face instead of bronze, since the latter penetrates the steel when hot and reduces its strength.

The various parts of the valve gear are subject to a great deal of breakage. Good pin fits in parts and bushings, low limit of wear, self lubricated bearings, roller bearings, tight fit of nuts and efficient nut fasteners are all essential in reducing these failures.

Some bolts, nuts and connections are very difficult to keep tight and require checking after each trip. For these a high grade bolt or pin material is required to eliminate stretch, and there are several types of fasteners available which are efficient in keeping bolts and nuts tight.

To reduce corrosion and corrosion fatigue of spring leaves, the finished spring should be immersed for several hours in a bath of hot anti-corrosive. This material will penetrate between the leaves, even under the bands, and reduce corrosion as well as provide some lubrication.

Hangers should be checked for cracks and defects. It is advisable to anneal them, especially if they have been chafed and built up.

Broken pipes cause a considerable number of failures. These are usually due to improper threads, poor alignment or poor clamping. Standard gages, rather than fittings, should be provided workmen for threading pipe so there will be a proper fit between pipe and parts or fittings. A definite arrangement of piping should be followed, with perfect alignment so as to remove all strain from joints. Pipe clamps of a good type in sufficient number and properly spaced, will greatly improve conditions. Flexible steel tubing has assisted in reducing certain types of pipe failures.

Periodic inspection of pistons, valves and packing for breakage and wear. Consideration might well be given to the solid lightweight steel piston, also to combination bronze-iron packing rings for both cylinders and valves.

A definite limit of wear should be established for all vital parts and these should be issued in booklet form for the ready reference of all concerned.

Lubrication and Heating Failures

The price of prevention of heating failures and the maximum mileage from bearings is good maintenance and eternal vigilance. Poor finish, improper fit, lack of attention and lubrication and sometimes quality of bearing metal or foreign matter in waste or lubricant are principal factors.

The character of the labor generally used for packing and lubrication is not the highest. It is, therefore, advisable to concentrate as much of the work as possible at one location in the terminal and thus permit of more thorough supervision and assurance that each bearing receives the necessary attention as well as standard methods and practices currently maintained.

Axle and crank-pin bearing surfaces should be very smoothly turned before rolling; otherwise in rolling the tops of deep corrugations this metal is liable to spaul off in service and cause heating.

Axles with collars should have the ends and collars smoothly finished to avoid picking up waste.

The bearing surface of rod bushings should be thoroughly rolled or burnished after smooth boring or turning so as to break in the bearing for immediate service.

For continuous good fit of rod bearings, crank pins should be maintained round and straight, preferably by periodic grinding. Many miles of service are removed from bearings in the boring mill because of out-of-round and tapered pins. Many main-rod bearings are broken in service because of excessive wear. The wear should be determined as accurately as possible by removing crank arms and crank-pin collars at least at 30-day inspection period.

Engine, trailer and tender-truck bearings should have the proper area of contact at crown and be fitted to the axle. They should be removed and inspected periodically in order to determine wear and ascertain that the lining is not loose or cracked. Even though the lining may be tight in a new bearing, dirt may work through the lining to the back and destroy the bond.

The type of casting for rod bearings, i. e., whether sand or chill mold, is important. Tests indicate the chill-mold casting is stronger by virtue of being closer grained and because of freedom from sand is less liable to heating. It appears that if pins are maintained round and straight, materially closer tolerances of bearing diameter to pin may be permitted with consequent increase in bearing mileage.

The selection of the best type of main-rod bearing, i. e., solid, three-piece or split, depending upon rod assembly, together with a minimum number of grease holes in floating bushings consistent with good lubrication, will assist in preventing broken bearings.

The tolerance and clearance of driving-box bearings on the axle is important for adequate lubrication. For these bearings consideration might well be given to the use of oil lubrication instead of grease and thus permit closer tolerances and higher mileage, reduction in pounds, loose bearings, general wear and tear and heating failures.

To keep driving-box face lateral within limits and prevent breakage and loss of the liner, there is a type of floating bronze liner for wheel hubs which gives excellent results.

A detail is the desirability of keeping cellar pin holes round so that the cellar will be always in proper location, and rigid material specifications should be in effect for the cellar pins which take a great deal of punishment in the way of wear and bending.

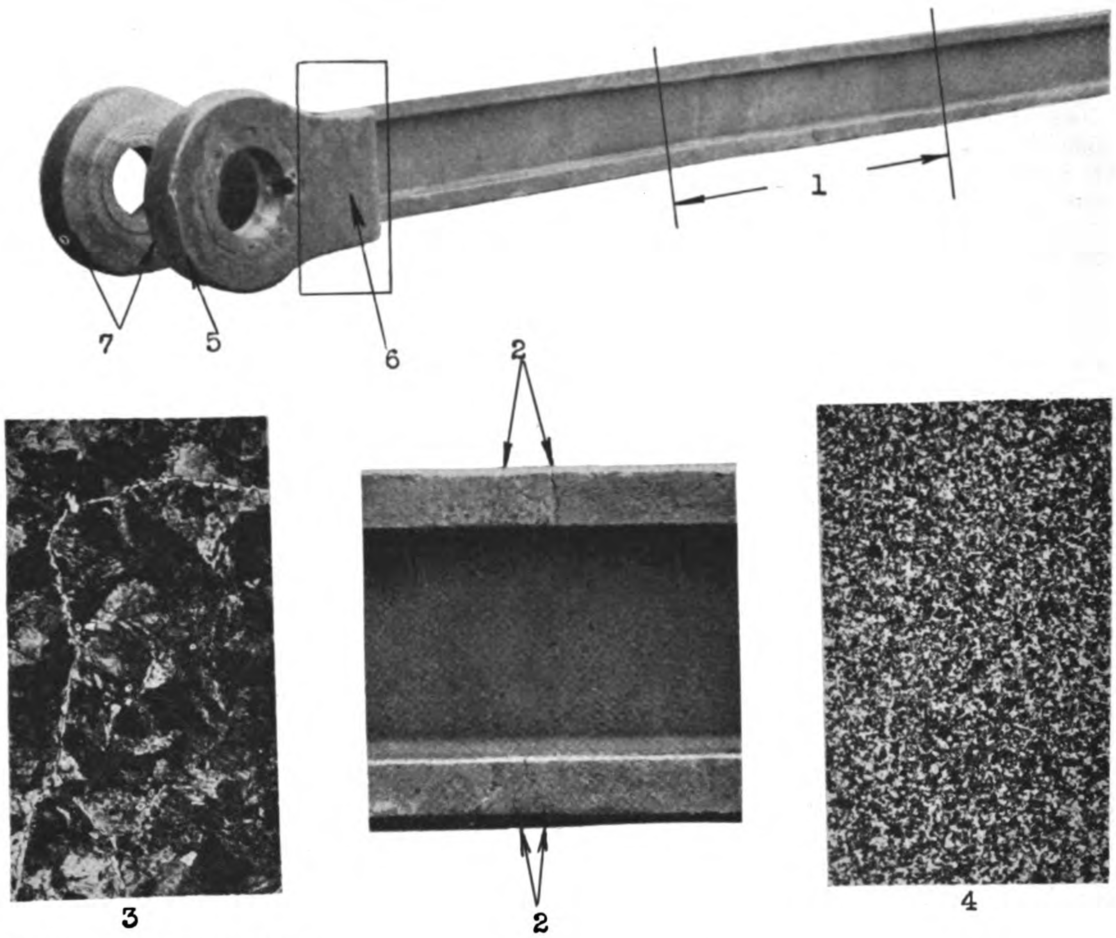
Force feed lubrication for engine-truck bearing and box faces, trailer-truck and driving-box faces, shoes and wedges and guides will reduce failures of these parts. The use of box type lubricators for engine, trailer and tender-truck boxes, as well as roller bearings has resulted in reduced heating.

Roller bearings on drivers are an important contribution and no doubt their use will be extended. They result in better mechanical conditions throughout the foundation of the locomotive in that they reduce pounds, stresses in pins and rods, wear of rod bushings and tires and increase the availability of the locomotive.

Steam and Leaks

When a locomotive is in the shop for general overhaul a great deal of consideration should be given to the condition of boiler and firebox sheets and parts with the object of avoiding constant repairs in the enginehouse, road failures and loss of mileage. Too frequently, parts are allowed to remain in use because they appear to have some additional value rather than to consider that before the locomotive again returns to the shop such parts, if left in, may cause great trouble and expense in constant maintenance.

New York, New Haven and Hartford R. R. Co.
PHOTOGRAPHIC REPORT
CRACKED AND BROKEN STEAM LOCOMOTIVE PARTS
ECCENTRIC ROD - LOCO. 1388



A. Cause of Failure.
   1. Steel overheated when adjusting rod length by a torch.

B. Result of Heating.
   2. Cracks which developed in overheated area.
   3. Microstructure of steel in overheated area; very large grain size.
   4. Normal microstructure of this same steel taken outside of overheated area; very small grain size.

C. Other Defects.
   5. Improper use of sledge hammer.
   6. Many nicks in this area.
   7. Sharp edges.

D. Recommendation.
   8. Close observance of "Ten Thoughts".

The flame of an oxweld torch has a temperature of about 6000°F. The microstructure of tempered steel is completely changed at about 1000°F.

Fig. 6—Photographic report of eccentric rod failure caused by overheating during process of adjusting length

A manual of standard methods and practices with respect to the construction and repair of boilers and appurtenances is desirable and from the standpoints of safety, performance and ultimate cost, it should be rigidly enforced at all times.

Frequent dumping, improper washing practices and rapid firing up of locomotives, impose terrific stresses on boiler, firebox and related parts and cause severe damage to sheets and bolts. A complete record of when and why fires are dumped should be kept currently and a study and analysis made with the object of reducing them to the minimum consistent with the operating conditions and to save fuel. This record will also disclose defects in boiler, firebox, auxiliaries and appurtenances so that prompt action may be taken to prevent or reduce failures.

One source of trouble with firebox sheets is leaks caused by cracks. Since the thickness of firebox sheets must be kept at a minimum, consideration should be given to the best possible steels. Tests have indicated that properly de-oxidized steels and certain types of alloy steels have reduced the tendency to cracking.

Fracture of staybolts is a factor in keeping locomotives out of service. Here again the matter of size is important and the smaller the diameter consistent with necessary strength, the better will be the results. To go along with the higher grades of firebox steels the best possible grade of staybolt material should be adopted.

A great deal of difficulty has been experienced on some classes of power with cinder cutting of flues. The proper grade of steel and an increase in the thickness of safe ends has been found to increase the service. There is a flue being made which incorporates thicker material at the firebox end. If these are not available, thicker material may be ordered in safe ends and one end reamed out slightly to equal more nearly the thickness of the body of the flue and avoid loss of strength at electric welds due to too much difference in gage.

A source of trouble which causes low steam and engine failures is plastered flue sheets. Another is the plugging of flues. For these, consideration might well be given to the use of sized coal rather than run-of-mine. A properly located brick baffle on the arch has also assisted.

Brick arch difficulties may be reduced by thoroughly cementing the brick with a high-grade cement.

Copper ferrules can and do cause poor welding of flues and wherever possible they should be eliminated.

As with the boiler itself, a high standard of repairs is necessary for superheater units, syphons, circulators and other boiler appurtenances. Superheater units will cause a minimum of trouble and expense if they are given a thorough repair when necessary in a properly equipped unit repair shop.

Leaks at pipe joints might be reduced by discontinuing fittings and welding the joints.

Blowing of cylinders and valves has been reduced by using bronze-iron lip-type packing together with a special type of iron for bushings.

Auxiliaries and Devices

Auxiliaries and devices are so tied in with the operation of the locomotive that their failure usually results in a failure of the locomotive. They occur not necessarily because of weakness in design or material but because the device is not always given the required standard of maintenance. Each is a complete machine in itself and is subject to the various ills of the locomotive itself, namely, cracked or broken parts, leaks, lubrication and wear and tear. It, therefore, follows that they should be systematically maintained and to prevent failures it is advisable to adopt much the same general procedure as with the locomotive. At large terminals it is essential to train specific men to make the current maintenance repairs and to become thoroughly acquainted with the device and the work.

The service engineers of equipment manufacturers should be given every opportunity to function at shops and engine terminals and their suggestions and recommendations considered and carried out.

Failures of auxiliaries and devices should be currently tabulated as to nature and cause so that any weakness may be quickly determined and corrective action taken.

Miscellaneous

In this category are road failures that occur so infrequently as not to fall in any special class. However, the aggregate of these failures is large and serious. The best manner in which to attack them is a general high standard of maintenance at overhauls, making doubly certain such parts as are hidden from ordinary inspection receive every attention. Also, the daily and periodic inspection and maintenance should be thorough and complete. Here, again, accurate failure reports and their analysis will prove of value in the endeavor to determine the proper remedial action.

Treatment of Locomotive Boiler Feed Water

Reduce demands for repair materials—Decreased time for flue and boiler work

By W. A. Pownall,

Assistant to superintendent of motive power, Wabash, Decatur, Ill.

The matter of treatment of water for locomotive use may or may not be considered a mechanical department problem but it certainly affects mechanical facilities—locomotives. The treatment of boiler water up to the point where complete results are obtained is offered as a simple means of materially decreasing the consumption of essential materials, and also improving operating practices. Until quite recently railroads have been slow in the development of water treatment, but during the past few years there has been a decided impetus given to the extension of water treatment, and most roads are now using some form of water treatment to reduce scale formation in locomotive boilers. These roads have competent water engineers for directing and supervising the treatment, and the manufacturers of boiler compound have well organized forces of traveling representatives who understand the principles of water treatment and who instruct and supervise the carrying

out of treatment on the roads where they are concerned.

However, the reduction of scale formation is not enough. The status of water treatment has not yet reached the point where scale is wholly prevented, it is merely reduced. The results are only partial, in fact, the results are disproportionately small considering the extent and expense of the treatment. As regards the use of the words "complete treatment" or "elimination of scale formation" we consider these as synonymous with freedom from boiler troubles and minimum expense for boiler maintenance.

Foaming Can Be Overcome

One obstacle in the past to the use of complete water treatment was the failure to understand how to control foaming, and progress was considerably delayed because of this fact. It is now well understood that foaming can be controlled by sufficient and timely use of the blow-off cock, both at terminals and on the road. As important adjuncts we have a device that gives visual indication to the enginemen as to the condition of the water in the boiler and, at the same time, automatically blows off the boiler to prevent foaming; we have the continuous blow-off cock, with which a predetermined amount of water, sufficient to control foaming, is continuously discharged from the boiler. There are well designed blow-off mufflers and separators, and at terminals there are devices used for determining the condition of the water in the locomotive boiler. By proper blowing off, the water in the boiler can be correctly conditioned before the locomotive leaves the engine terminal.

Complete Treatment Gives Results

The art of water treatment for locomotives has now developed to the point where there need be no hesitancy in adopting it completely. Some railroads are using little or no water treatment. Other roads are using water treatment rather extensively, but in some instances treatment is not carried to the point where scale formation in the boiler is eliminated, and the maximum advantages are not being attained. Water treatment should be made complete on all locomotive operating divisions as soon as possible. Present methods of water treatment are well known. They consist of internal treatment with chemicals such as soda ash, sodium aluminate, tannin and some alkaline or caustic sodium salt; boiler compounds alone; boiler compound supplemented by soda ash or sodium aluminate and the lime-soda softener. Since quickly obtainable results are the object under the present emergency situation, the internal treatment seems to offer the best solution. The methods are relatively inexpensive, require simple apparatus for application of treatment, and, at present writing, the treatment materials are available.

Mechanical Benefits

The practice of welding flues to the flue sheet has largely done away with road detentions due to leaky flues. These were prevalent in bad water or untreated water districts before this welding practice was adopted. However, the fact that the flues are not leaking because they are welded to the flue sheet, does not mean that the cause of the trouble has been removed. If the waters are untreated, or only partly treated, the heating surfaces are still more or less covered with scale, with loss of power, loss of fuel and ultimate staybolt and firebox renewals resulting. Where fully treated water is used, the time of a locomotive in the shop or in the enginehouse for boiler washout and boiler work is materially reduced. This is a well known fact, and has been commented on in mechanical papers as a contributory factor in high locomotive mileage. It is also recognized that with proper and complete water treatment, locomotive boilers need be washed only every 30 days, and flues may last between resetting at least the full four-year period permitted by law. Other important operating and economical advantages are well known by mechanical and operating officers.

At one time the writer had occasion to keep records of cost of boiler repairs as compared with total locomotive repairs on various operating divisions, and as an indication of the money savings that could be made, would cite the best treated division where the cost of boiler repairs was nine per cent of the total cost of repairs while on an untreated division with the worst water the cost of boiler repairs was 31 per cent of total locomotive repair costs. Naturally, this difference in boiler repair costs is reflected in a difference in material costs.

Material Savings

The writer does not have information for roads where water is not treated or is only partly treated, concerning renewal of fireboxes, staybolts, consumption of flues, staybolt iron, boiler steel, etc., but the record in the table is offered as representing what is being done on a road where the treatment is complete and excellent results are obtained.

What Complete Water Treatment Accomplished on One Road

New fireboxes per 100 active engines per year	1926-1941	0.4
Previous to use of treated water as high as	....	12.0
Broken staybolts per active engine per year	1932-1941	1.71

Material Used 1939-1940

Material	Per 1,000 locomotive miles	Per active locomotive per year
Staybolts and staybolt iron, lb.	2.06	79.5
Boiler and firebox steel, lb.	11.47*	432.0*
Number of tubes and flues	0.25	9.54
Tubes and flues, ft.	5.11	197.0

* Part of this material used for liners, shims, and other non-boiler repairs.

These records of material consumption may be used for comparative purposes by roads using untreated water, or where only part of the water supplies are treated, as an indication of the reduction in demands for material that could be made by treating or completing the treatment.

Raw Water Conditions

The raw water supplies are fairly hard waters, such as are ordinarily used through the middle west. All types of water are encountered, those that are low in hardness and where little or no treatment is required, the moderately hard waters of the middle west, the waters that are not only hard, but are also high in foaming salts, and those where sudden fluctuations in mineral content demand constant watchfulness on the part of the water engineers. All can be treated. Some are easy, some are difficult, but in all cases competent supervision is absolutely essential so that treatment is complete and uninterrupted. It may be that some roads using waters of similar quality already make a better performance than indicated above, but it is reasonable to believe that in many instances the consumption of boiler material is much higher; and it is the object of this article to urge the early extension of or adoption of water treatment by any of the convenient means available to improve locomotive operation, reduce operating and repair costs, and to greatly reduce the demands for the now much needed iron and steel.

Cut Down

Engine-Terminal Time

Suggestions for increasing the number of hours that locomotives are available for service

THE major points in the two papers in this section were also suggested in several other contributions, but were much less completely developed in them. Some of these are set forth in the brief paragraphs at the end of this section because of the emphasis they give to the methods proposed in the papers themselves.

The material presented in the following pages suggests that the steam locomotive, insofar as increasing its utilization is concerned, is very much the victim of its own long history. Its disability arises in part from methods of servicing and making running repairs which are still as deeply ingrained in the fabric of railway operation as was the idea of assigned locomotives a generation ago.

Streamlining the Engine Terminal

"Receiving ward" plan is designed to speed normal daily servicing and repairs

By A. A. Raymond,

Superintendent fuel and locomotive performance, New York Central System, Buffalo, N. Y.

The modern steam locomotive will operate over a long period with a minimum of repairs. How can inspection and repairs be made with the minimum out of service time? It is the purpose here to discuss the active engine; that is, not the handling of engines in the backshop, or for quarterly repairs, but the handling of the thousands of the engines that are arriving daily for fire cleaning, coal and light servicing and which are returned promptly to the operating department for trains. This logically can be divided under two headings.

Facilities are available at many points, perhaps on the main line, where the fires of road locomotives can be cleaned, the engines coaled, watered and greased, and proper inspections made so that the engines may continue through with the trains. But such plants, have not, in general, been installed in yards. With conveniently located facilities in yards, using a small locomotive coaler costing about $1,000 and bucket ash hoist, costing perhaps $1,500, with foundation, etc., costs $10,000, yard engines can be operated 30 days a month, with the crew eating their lunch while the engine is being reconditioned.

What is of perhaps even more importance is the handling of engines that go to the enginehouses. Here engines might be separated into four general classes. (1) those requiring general shopping; (2) those requiring quarterly or periodic reconditioning; (3) those requiring monthly washouts and (4) daily or trip tuning up of locomotives.

The Problem of Increasing Locomotive Utilization

Considering 100 locomotives, it might be estimated that the work listed in the four items above would be required by all of these 100 locomotives during a year's time, approximately as follows:

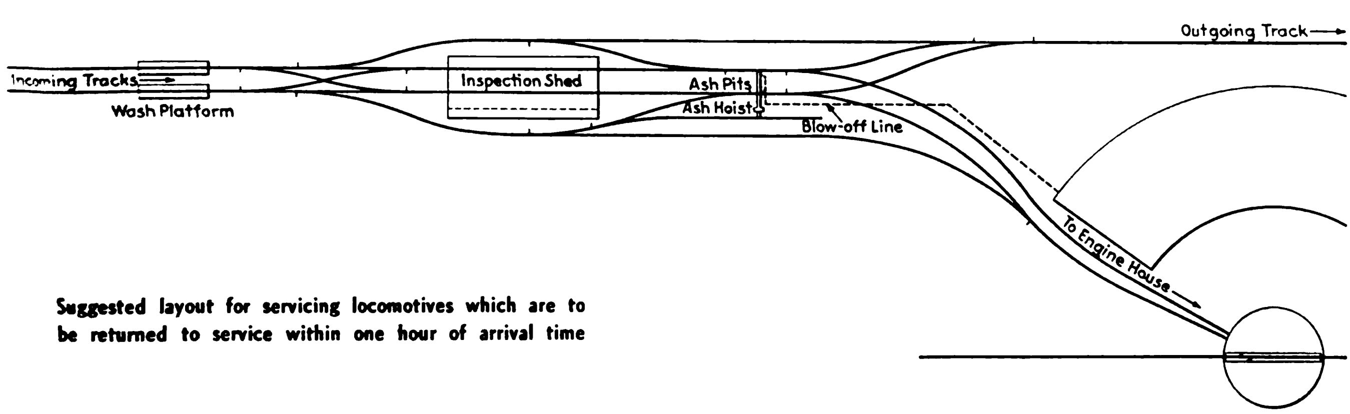
1—Shopped each two years would mean 50 locomotives a year.

2—Quarterly inspection would mean 400 required a year.

3—Monthly inspection would mean 1,200 required a year.

4—Daily inspection, estimated dispatchments 1.2 per locomotive per day, 43,800 per year.

It appears that, with such a large number of daily



Suggested layout for servicing locomotives which are to be returned to service within one hour of arrival time

inspections, the importance of controlling the cost is a major problem. If this work cost, say $7.00 a dispatchment, but can be reduced to $6.10, a saving of almost $40,000 can be made. This saving is an item of major importance, in the average operation of a locomotive terminal.

A second item of perhaps even more importance than the expense at this time is the prompt return of locomotives to service which do not require heavy repairs. The value of 100 modern locomotives, costing approximately $190,000 apiece, is $190,000,000. Suppose that 100 such active locomotives are working 16 hours a day, we have one third of the time idle, or approximately $63,000,000. This would seem to indicate the maximum importance of daily idle time at enginehouses.

If then, the proper war effort is to be made, detailed and definite consideration should be given to an organization of facilities, to reduce idle time and effort to the minimum. For instance, the most important item to prompt handling is that when a locomotive arrives, consideration be given immediately to the work report of the arriving engineman, and that at the same time, a complete inspection of the locomotive be made by the enginehouse mechanics, so that within 20 or 30 minutes of the time that the engineman gets off the engine, the competent foreman will size up its condition and be able to tell his engine dispatcher the time the engine will be ready for use. If only minor adjustments are necessary, the dispatcher can mark the engine up. The fire can then be cleaned and the engine can be coaled and watered while the crew is coming to take her. With proper operation it is believed that the engine will be back in service within an hour after it reaches the terminal.

Inspection Pits Become Repair Points

The importance of moving the machine to the men can be illustrated by the automobile industry, where one man puts one small part on large bodies having the trim applied. It would seem that the man should stick a bundle of these parts in his pocket, walk down the line of bodies and attach this minor item, but it has been found that for maximum production, these bodies, although large and cumbersome, requiring only small pieces here and there, should be moved to the man. Considering the practical impossibility of building enough new locomotives and maintaining the maximum war effort and the shortage of man-power, the following are suggested for thought:

1—An outside inspection pit, so arranged that the engineman will leave the engine on the pit, get down off the cab and got into a work office, located not over 30 ft. away.

2—Inspectors immediately start to go over the engine.

3—An adequate pit under the engine, so that any underneath work, such as doping, can be handled with the minimum of effort. If the doper finds that the lining of an engine-truck bearing is beginning to work out power-operated jacks are handy on the floor which immediately can take the weight off so that the bearing can be changed.

4—If cylinder packing is to be removed, impact wrenches are available so that a man on the floor can take off the top nuts, while the man in the pit is removing the bottom nuts. There will be a small crane for handling cylinder heads and a piston buster available to be used if necessary.

5—Attachments will be provided so that a boiler can be blown down without excessive noise; that is, piped outside with mufflers, etc., for water reconditioning.

6—A platform at running-board height is accessible quickly from steps in the corners.

7—If it is necessary, for instance, to change a water pump, it can be picked out of the small stock available and immediately applied by a power truck.

8—A foreman should be in charge, so that immediate decisions can be made as to the work to be done, availability of the engine, and if it is OK, the work clerk may immediately call the outgoing engine dispatcher.

9—Continuous study should be made of work required on engines and equipment set up so that the work can be handled in not over 30 min. on this inspection pit.

The size of this plant depends on the number of road locomotives to be handled. At 30-min. intervals, it would work out 48 engines a day, but some allowance must be made for delays, etc., so that perhaps 36 engines a day per pit would be a better figure. Thus, if there are 105 engines to be handled a day, there should be three tracks through this plant, with quick opening doors at the ends, adequate heating facilities, and pits with passageways underneath so that the doper and others who find it necessary to work under the locomotives will not have to climb up and down for each engine, but may walk back and forth under them.

Some engines arriving will be due for washout, or it will be found necessary to do heavy work. Those engines will be handled around the plant, all inspection, etc., to be done in the enginehouse. In other words, that will be an enginehouse assignment and not an inspection-pit job.

The drawing shows the general layout of an enginehouse with this proposed engine handling facility. In addition to the inspection pits the shed houses a small storeroom, a toolroom; a work-report room, an office, power trucks, movable platforms from which the men can work, etc.

Walking Time Can Be Reduced

With such installations experience has indicated that sometimes the force of men put on them (due to fluctuation of business) find much idle time, so that this complete plan can only be used where there are enough dispatchments to support it, but if there are multiple pits, engines can be set on one pit while the men are working on another, so that when they complete an engine it is only necessary to walk a few feet to the next pit. At some terminals the men spend a substantial per cent of their time walking.

The management of this plant must do some planning to keep work continuously ahead of the men. For instance, if it is seen that there is a lull or break in incoming engines, engines would be brought from the house and, of course, various parts, dope, oil, jacks, tools, and equipment should be readily available so that the men only have to move to the wall of this "receiving ward" to obtain any necessary material or tools.

This general plan must be adapted to local conditions and the thought behind it is a "receiving ward" where within 30 min. after the arrival of an engine at a terminal a decision can be made as to whether it can be used promptly or whether it will have to be held for repairs. The utmost ingenuity should be used in equipping this receiving ward so that all normal jobs can be handled. With a compact organization such as is suggested it should be possible to add enough mechanical facilities so that a job now taking two or three hours can be handled in the normal movement of the engine through this resourcefully supervised organization.

iii – 11

Speed Locomotives Through the Engine Terminal

Suggestions which have removed bottlenecks both inside and outside the house

By D. V. Gonder,

Locomotive foreman, Canadian National, Montreal, Que.

Different engine terminals and main backshops frequently have identical problems. In locomotive maintenance there are so many points of similarity that the ideas found helpful at one station can be adapted to good use at others.

One engine terminal, to which is assigned a large number of heavy freight locomotives, had recently absorbed practically all the available skilled labor. Increase in business created a man-power situation which this local point had to meet. When satisfactory man-power could not be transferred from other shops, consideration was given to relieving the terminal of some of its work. One of the main backshops has a running shed, suitable for light repairs to engines from which wheels are not being dropped. It has been found that a considerable proportion of the hydrostatic tests, formerly handled at the enginehouse, can be performed at the main backshop. The usual rod work and light repairs, ordinarily taken care of at the same time are now handled by the main shop.

Getting More out of Engine Terminals

It is an axiom that engines cannot be turned out of an enginehouse any faster than they are put in. Thus, it is of paramount importance to reduce to an absolute minimum the time elapsed in getting an engine from its arrival on the shop track to its place in the house.

Marked increases in power turnover demand that every ingenuity be exercised to prevent facilities being taxed beyond their capacity at peak periods. Where pit space in an enginehouse is at a premium, consideration can be given to equipping all the extra long pits, with which most large terminals are provided, with additional smoke jacks at the turntable ends of the pits. During the periods of congestion, two short engines, back to back, can then use a single long pit.

A study may also suggest the use of additional outgoing tracks, branching off the lead from the turntable. A bank of serviced engines can then be placed outside under steam, awaiting dispatch. This will provide more pit space in the house.

Simple Improvements in Track Layout

Substantial improvements in shop track layout can result from minor alterations. One enginehouse, handling road freight and switching power, is equipped with two efficient cinder hoists on separate incoming tracks. Until recently, one of these tracks was restricted to small power because of a sharp curve at the turntable. Large power frequently overcrowded the other track with consequent delay. Half a day's labor with a section gang eased out the restricting curve, split up the ashpit work, and almost halved the incoming time required per locomotive.

The movement of engines can be speeded up by the use of spring and pneumatic switches at vital points. Operating levers for pneumatic switches can be put on posts at cab height, far enough away from the switches to enable a hostler to set his course when approaching them.

Many enginehouses still have balanced type, center suspension turntables. It is necessary to balance engines carefully on such tables to enable the motor to move the table. At one enginehouse the 100-ft. table of this type had roller bearings applied at each end over the circle rail. The vertical clearance at each end was at the same time reduced to a minimum. This has produced practically all the advantages of three-point suspension. No longer is it necessary to balance engines with anything like the same precision and all turntable movements have been speeded up.

Special Supervision for Engine Movements

Where the volume of engines handled warrants, it is advisable to put on special supervision for all engine movements. Supervisors of the regular repair staff are then not required to leave important duties to speed up the movement of engines into and out of the engine house.

This outside supervisory force can also play a very important role in the educating of new or "green" hostlers and engine watchmen, in the performance of their duties. Sad experience teaches how quickly a whole terminal can be tied up by an engine off the track at the turntable or a vital switch.

It has been found helpful to have fireboxes examined and boilers blown as soon as the fires have been dumped. This can best be done, by a crew specially assigned to the work. After the engine is in the house and the firebox and front-end work is completed, steaming-up becomes the prime consideration.

Oil Fuel for Steaming-Up

Oil steaming-up has provided substantial savings in labor, time, and convenience. Portable high-capacity burners, each easily handled by one man, are placed at the posts nearest to engine cab doors. Each burner is connected by hoses to overhead air and oil lines running completely around the house. Cheap, low-viscosity oil is steam-heated and pumped in continuous circulation at a fixed pressure. Without the use of coal, boilers can be brought up to a full head of steam for pump and injector tests, etc., and for the movement of engines under their own power. When serviced, engines can also thus be steamed-up and made available for immediate dispatch without concern for subsequent fire cleaning. When needed, the bed of coal can be laid and kindled with the steaming-up burner.

In conjunction with oil steaming-up, portable ring air blowers, suitable for slipping down engine stacks, have been found efficient and economical. These should be coupled to a separate air line around the house. Ring blowers, oil burners, and their separate parts, can be made up at the main shops to standards suitable for use at all enginehouses over a given territory.

Most important of all, it must be remembered that there is no substitute for personal zeal on the part of the supervisory staff. To cope adequately with the increased demands now being placed upon our transportation facilities, every mechanical department man must be

on his toes. If a supervisor does not show the initiative and energy necessary to the successful prosecution of his job, the best of improvements and ideas will be ineffectual.

Don't Miss These Ideas

Failures Result from Lack of Alertness

At times epidemics of eccentric rods becoming disconnected at front or back end will occur, resulting in expensive engine failures. Occasionally a knuckle pin falls out and a gang is called to clear away the broken mess so that the engine can get back to the roundhouse to be tied up for a few days while expensive and hard-to-get new parts are being applied. These types of failures should be about as prevalent as the well-known hen's teeth but still they happen because somebody was not alert or passed the buck.—*Fred C. Barnes, Laramie, Wyo.*

More Spare Parts, Fewer New Locomotives

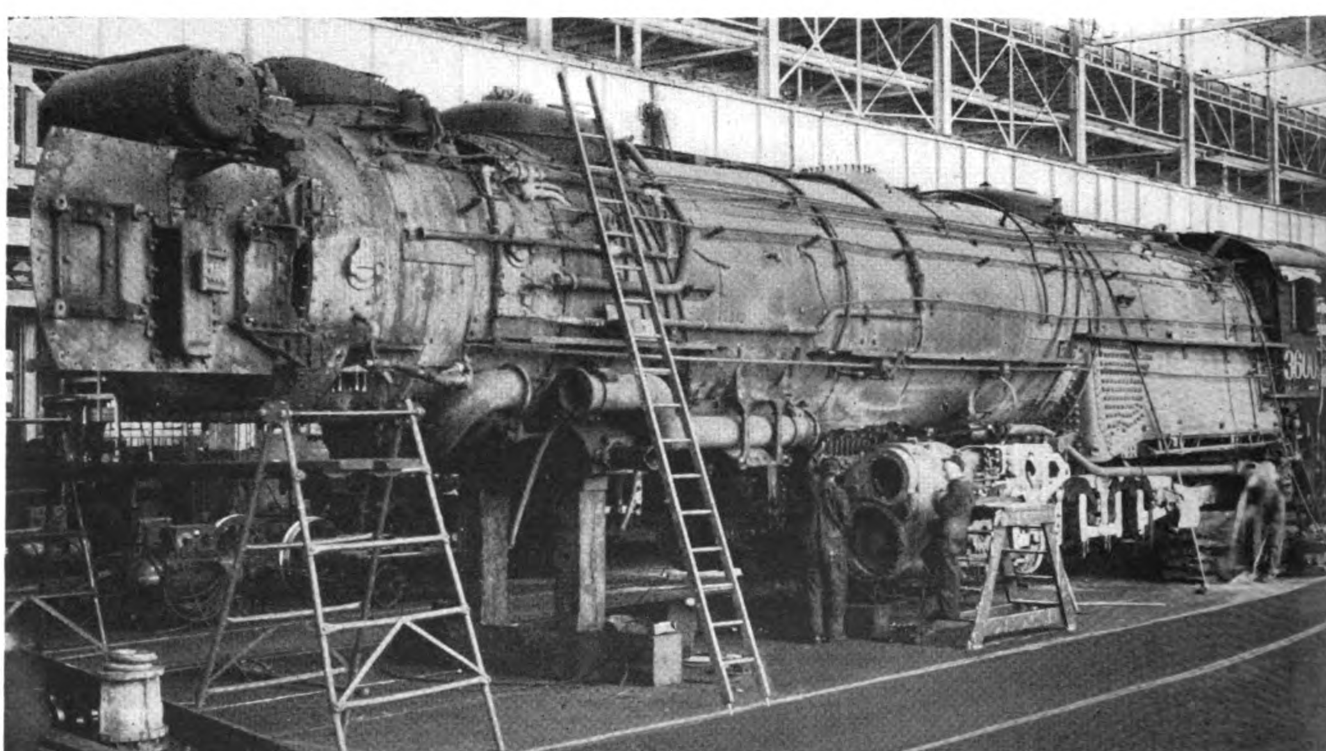
If we had our rods, motion work, driving boxes and spring rigging prepared before the locomotives come into the roundhouse for inspection, we would save many hours. Rods should be cleaned, magnafluxed, rod bushings fitted, and in a good many cases bored to fit the pins. Naturally, to do this would require extra rods, motion work, driving boxes and spring riggings, but it would certainly be profitable. A card record could be maintained of pin sizes, and of driving-box journals on each locomotive. Journal sizes, incidentally, should be standardized as much as possible as the distance between the shoe and wedge faces is very important. In this manner we would have a clear-cut picture of the locomotive repairs before the locomotive was entered. While it is true that more steel would be needed to stock up our "assembly lines," it would be cheaper to buy steel parts than to buy new locomotives. These assembly lines at quarterly inspection time could then be one step ahead of the locomotive to be inspected by having each piece of equipment there at hand and ready to assemble as soon as the motion work is taken down. In this way we would be a step ahead and cut down on inspections and time out of service by at least fifty per cent. *J. P. Ball, Elkhart, Ind.*

Keep Men and Tools Together

Certain stalls in enginehouses should be allocated for certain types of repair work and men, with their tools and repair equipment, should be assigned to those stalls. In other words, everything for the job should be at the job if at all possible. A roving mechanic who has his tools in one end of the shop and his supplies locked up in a storehouse while he works in the opposite end of an enginehouse is a luxury that the modern railroads can ill afford when the watchword is to save time and materials. A man who becomes a specialist in his line of work can save both and do a better job.

Cooperation can come from the outside inspector who designates the stall for the equipment, the master mechanic who outfits his enginehouse stalls with the proper machines and handling equipment, the stores department that keeps the proper supplies at the job, and the foreman who designates the proper man for the job on which he shows aptitude.—*Eugene W. Preble, Alexandria, Va.*

* * *



D. & R. G. W. articulated locomotive undergoing heavy repairs at the Burnham locomotive shops, Denver, Colo.

Time and Material Saving Ideas in the Field of

Railroad Shop Practice

A selection of practical suggestions from many sources showing how shop facilities may be utilized to the greatest advantage and how improved methods may speed up shop operations

FROM the railroad repair shops of the United States—small and large—and from others indirectly associated with railroad shop work—a total of 15 papers were submitted as entries in the contest. On this and the following 11 pages appear a selection from the wealth of material dealing with this important part of mechanical department work. Leading off this section is a paper on the potentialities of the internal grinder in the finishing of a variety of locomotive parts in which the author has analyzed the savings that might be expected as a result of the full use of this type of machine. Another contribution shows the way to the solution of a difficult job of boiler shop work.

In these days of 24-hour, seven-day operations we may feel that the depression's years are far behind us so another author is reminding us that the trying experiences of the depression years were in reality but a training school in which we learned lessons of present value. Other contributions will appear in future issues.

Grinding — A Practical Aid to War Production

An analysis of the comparative cost of finishing locomotive parts by tooling and grinding

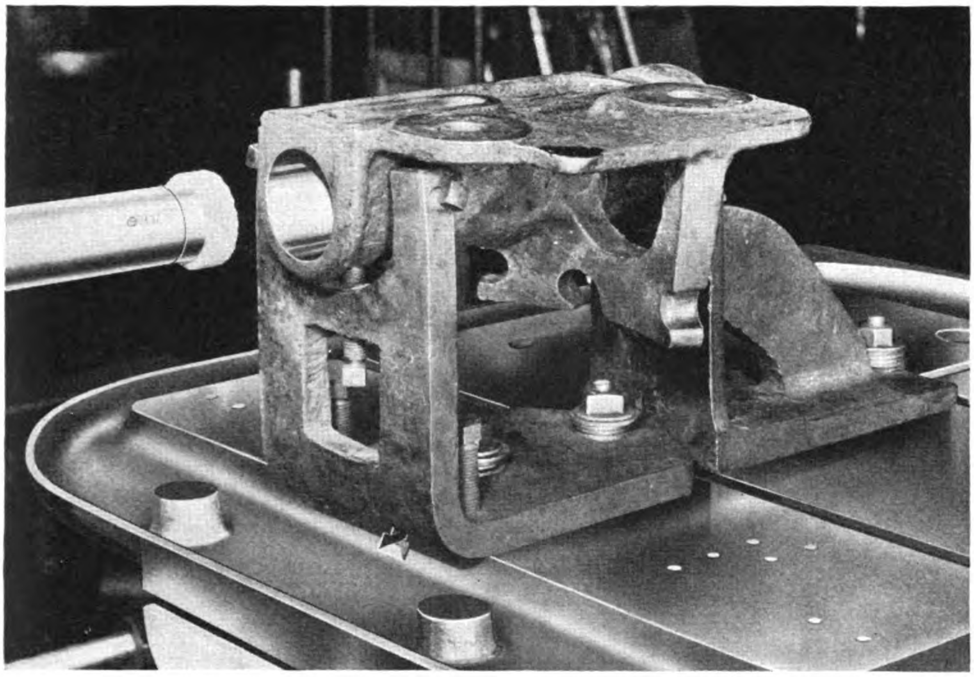
By H. H. Moor,

Sales manager, Grinder Division, Micro-Westco, Inc.

Railroad mechanical officials and shop personnel have justly earned public acclaim for their competent efforts to meet the heavy demand for locomotives and cars in this time of national emergency. And they have been obliged to increase results with facilities at hand, since high priorities on machine tools for defense contracts have brought about a scarcity of new equipment and long deliveries.

Ingenious methods and mechanical experience have contributed much to the speeding of repair operations, but frequently overlooked is the fact that additional and valuable gains can be made through the reconditioning of many locomotive parts by grinding instead of tooling. Cylindrical and internal grinders are available in most repair shops, and the advantages offered by these machines are numerous and far reaching. Not infrequently, however, these time and labor saving tools stand idle while the work for which they are ideally suited is done on lathes and boring mills.

Because time is an important factor in the defense program, it is of particular significance that the benefits of grinding be promptly realized. The grinding oper-



Franklin Butterfly firedoor cylinder set up on a special fixture for grinding

ation invariably requires less time than other methods and removes a minimum amount of stock with a worth-while saving of metal. The accuracy and superior finish produced by grinding insure close fits and maximum bearing surfaces that are essential to trouble-free operation, the ground parts run longer before repairs are needed again, and of great importance, grinding increases the life of parts by 150 per cent to 300 per cent.

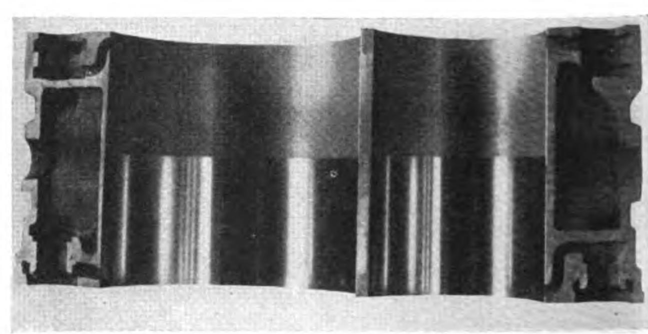
The comparative effects of grinding and tooling on locomotive parts in general are well demonstrated by the fact that a worn piston rod can be trued up accurately and smoothly by cylindrical grinding with only a slight reduction of its diameter, whereas the same job in a lathe requires the removal of more than twice as much metal due to the necessity of the turning tool to penetrate beneath the glazed surface. Hence, the lathe operation shortens the life of this expensive part, and the resultant finish is not of sufficient quality to insure steam-tight packing contact or longest wear.

To determine whether one process of reconditioning is better than another, several factors must be taken into account. Original cost of the part, expense of maintenance between shoppings, amount of money spent at repair periods, and life of the part, all have an important bearing upon the net results. Only by complete analysis, therefore, has it been possible to ascertain the total effects of the tooling and grinding processes on various locomotive parts.

One such investigation was conducted on driving rods, since the need for repairs to these important members is one of the chief causes for heavy expenditures. The findings of this analysis prove conclusively that grinding the rod eyes will save an unusual amount of money, and also serve to demonstrate how the several factors were considered in all the surveys made.

A 4-8-4 locomotive was selected for this driving-rod analysis, because this type is fairly representative of the general run of freight and passenger power on the railroads in the United States and Canada. This particular locomotive is a modernized type, equipped with light-weight channel rods which cost $1,850 for the complete set of eight. It was also found, however, that some of these locomotives were equipped with rectangular rods that cost only $1,050 for the entire set. Although the trend is toward the light-weight rods for high-speed service, a conservative average of these two prices, or $1,450, is used in the survey as the representative cost of a set of rods.

On this type of locomotive, the back ends of the main rods and the main-pin ends of the intermediate side rods are equipped with cast-iron fixed bushings and brass floating bushings. The other rod eyes are equipped with pressed-in brass bushings. The diameters of the 14 rod eyes, exclusive of bushings, are as follows: main rods, 12 in.; intermediates, 12 in. and 7-in. knuckle-pin holes, 5½ in.; front ends, 6½ in.; back ends, 6½ in.



Section of a cross compound air compressor in which the finishing has been done by both boring and grinding to show the difference in the surface

Tram centers of wheels were 5 ft. 8 in.

The investigation disclosed that some of the rod eyes have been reconditioned by boring during the past several years while others were ground on an internal grinder, which fact has made possible some interesting comparisons of actual results. Labor costs in this and the other surveys made are based upon the new rates of 96 cents an hour for machinists and 70 cents for helpers. Engines are shopped every four years as an average for new boiler flues and a general overhauling. Rod eyes are refinished at each shopping period to restore roundness.

Effects of Boring and Grinding the Rod Eyes

The number of times a part can be reconditioned before reaching the condemning limit depends upon the amount of metal removed each time and the wear. In this case the oversize limit for the rod eyes is 1/4 in. and the rods are retired from service when this limit is exceeded.

The average time for reboring all of the 14 rod eyes on this type of locomotive is 22 hr., and the average time for regrinding is 18 hr. Especially important is the fact that the amount of eye enlargement at each shopping period (every four years) by boring averages about 5/64 in., and by grinding about 1/32 in. As a result of the excessive enlargement by boring, the rod eyes can only be reconditioned three times before the 1/4-in. oversize condemning limits are reached, therefore the life of these expensive parts is shortened to 16 years including the first four years of service while the rods are new. Owing to the small amount of enlargement by grinding, the rod eyes can be refinished eight times (every four years), hence the life of the rods is increased to 36 years, including the first four years of service, which is longer than the life of many locomotives.

These findings show that boring the rod eyes will cause the railroad to spend $1,450 for the new set of rods, plus a total of 66 hr. machinist labor for reboring the eyes three times during the 16-year life of the rods, an average expenditure of $94.58 per year.

During the 36-year life of the ground rods, $1,450 will be spent for the new set of rods, plus a total of 144 hr. machinist labor for regrinding the eyes eight times, an average expenditure of $44.12 per year.

This divulges that grinding the rod eyes will save about $50 per year on the bare rods alone of each locomotive overhauled. At 18 hr. per set of rods, one internal grinder will be kept continually busy on the rods of 11 locomotives a month, or 132 locomotives in 12 months, at an annual saving of $6,600.

Effects of the Two Processes on the Fixed Bushings

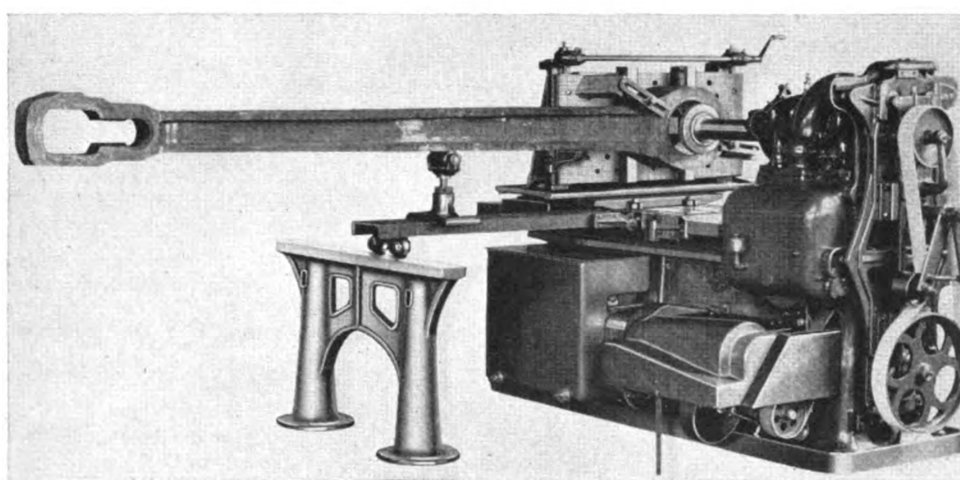
The four fixed bushings of these rods are close-grain grey cast iron and cost about $8.50 each for material and labor. To permit close inspection for rod defects, these members are pressed out at each shopping period. Where the rod eyes have been bored, the fixed bushings have had a tendency to work loose on account of poor bearing surfaces on top of the boring-tool marks, and although pressed in at 40 to 50 tons, are frequently loose enough to drop out of the rods when the engines come in for shopping. This means that about half of the fixed bushings, (two on this type of locomotive) must be renewed at a unit cost of $8.50, or $17.00 on each of the 132 locomotives overhauled in a year, a total annual cost of $2,244.

Loose bushings in service not only result in excessive pounding, wear, and undue elongation of the eyes that require over enlargement for true-up at shopping periods, but present some difficulties at the terminal points when renewing floating bushings.

The expense of new fixed bushings is saved when the rod eyes are ground because the bushings stay tight. Only 15 or 20 tons pressure is used to press the bushings into the ground eyes, and they actually require as much as 40 to 50 tons for removal. The first case is yet to be found where a bushing became loose in a rod eye that was finished by grinding. When removed, these bushings show full bearing, shiny surfaces and can be tightly pressed back into the rods for further use after the inspection is completed. The insides of the fixed bushings are always ground with a light true-up cut after pressing in.

Correcting Tram Centers

Particular attention is paid to tram centers which are held closely to blueprint dimensions. During the tramming operation, the eyes are marked with chalk .010 in. long or .015 in. short as the case may be. The graduations on the cross-slide of the grinder are especially valuable for quickly correcting these tram centers.

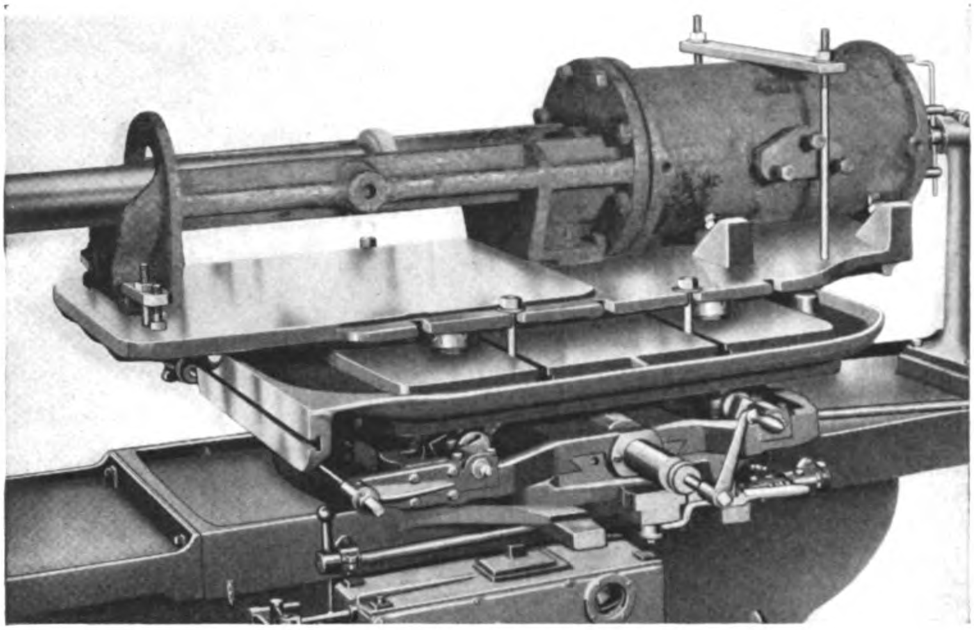


Grinding the fixed bushing of a main rod after the bushing has been pressed in. The special stand provides rigid support and eliminates the necessity of overhead suspension

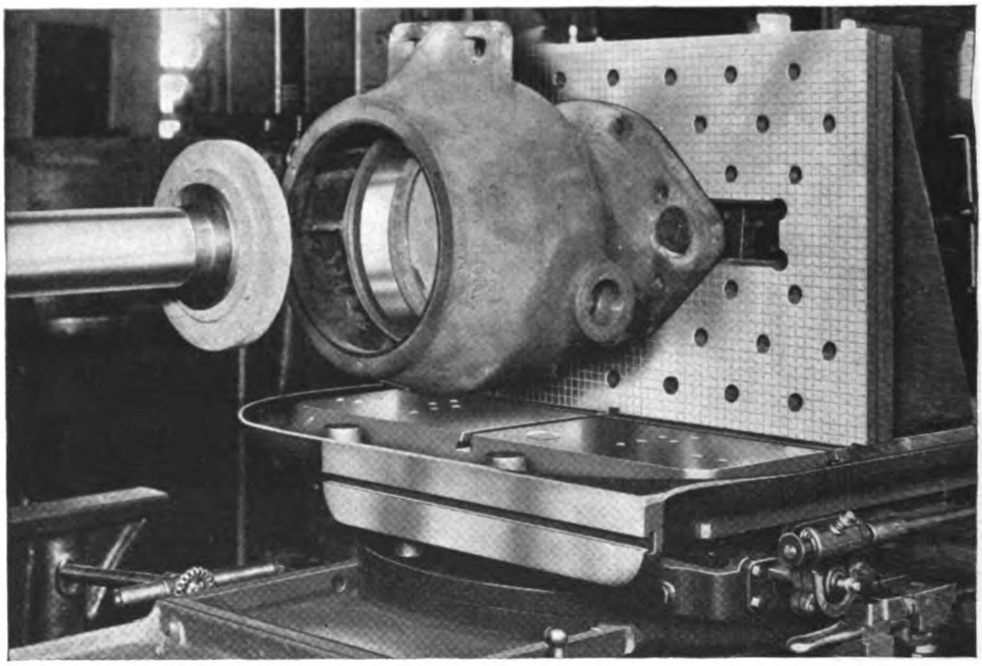
Grinding Saves Floating Bushings

Owing to the accuracy, smoothness, and full bearing surfaces provided by the ground fixed bushings, the brass floating bushings will run longer before renewal is necessary. It has been carefully estimated that at least a pair of these floating bushings will be saved in the main rods during the first year of service, while the crank-pins are comparatively round. This means that about 22 floating bushings, which cost $24.40 each, or $536.80 for all, will be saved while the first month's output of 11 engines is in service the first year.

Eleven more locomotives will complete their first year of service each succeeding month, hence an additional saving of 22 floating bushings, or $536.80, will have been earned at the end of the thirteenth month and each month thereafter. At the end of two years, therefore, a total of 286 floating bushings, or $6,978, will be saved.



Grinding the circular guides and cylinder of an Alco Type E power reverse gear on an internal grinder. In this case a heavy duty spindle and special fixture are used



This is a simplified set-up for grinding a throttle valve chamber

During the second, third and fourth years of service after the locomotives have been shopped, the life of the floating bushings is largely dependent upon the condition of the crank-pins. If the pins are around during these years, further savings on floating bushings may be realized, but since this is problematical it has not been taken into account.

Grinding Other Locomotive Parts

Too great length would be required to show all the figures of the several other investigations made, but the net results on the major parts that might normally be reconditioned on an additional internal grinder are shown in Table II.

This tabulation shows a yearly saving of $77.91 per locomotive for material and labor in favor of the grinding process, but does not take into account that the steam saving with three popular types of air pumps averages about $95 per year for each pump, which savings have been proved by a series of costly tests that are representative of actual operating conditions. The annual saving to the railroad, therefore, as a result of the grinding of these miscellaneous parts is approximately $172 per locomotive.

The above list of parts require approximately the same amount of time as the set of driving rods (18 hours), thus the second internal grinder will handle all other parts on 11 locomotives a month, or 132 a year, at a total saving of $172 times 132 which equals $22,704 per year in material, labor and steam.

Table I — Summary of Savings Made on Rods and Bushings

Material and labor saved each year on the 132 sets of rods, exclusive of bushings	$6,600
Material and labor saved each year on fixed bushings, $17 for two bushings times 132 locomotives	2,244
Material and labor saved during the first year of road service on 22 floating bushings at $24.40	536
Total saving the first year as a result of grinding the rod eyes and insides of fixed bushings	9,380

It is of course recognized that types of equipment on the many styles of locomotives are widely diversified. Although an engine may not be equipped with driving boxes of the floating bushing type, it may be operating with two cross-compound air-pumps, or a feedwater pump. Then, too, other parts that might require grinding are booster engine cylinders, stoker engine cylinders, bell-ringer cylinders, grate-shaker cylinders, Diesel-engine cylinder liners, motor-car cylinders, exhaust bushings and main-valve sleeves of air-pumps, etc. The net results, therefore, are not apt to vary an appreciable amount.

The ability of these two internal grinders to earn a clearly indicated saving of over $30,000 each year strongly suggests the advisability of keeping grinding machines busy.

Table II — Comparative Costs of Finishing Locomotive Parts

	Average annual costs of material and labor per locomotive	
	By Tooling	By Grinding
1—Cross compound air-pump	$53.28	$24.26
1—Power reverse gear with circular guide	5.08	3.50
1—Set of valve-motion parts	53.57	19.19
8—Driving boxes of floating bushing type	30.08	19.20
1—Chambers throttle valve	1.38	.88
1—Fire-door-opener cylinder	4.00	2.45
Total	$147.39	$69.48

Study The Job More Intensely

Many of the problems with which we are daily concerned offer opportunities for improved solutions

By Harry G. Miller,

Engineer of Tests, Chicago, Milwaukee, St. Paul & Pacific

The equipment and ability is available to make improvements in shop production, the utilization of machine tools, improved engineering design and the selection of materials to release critical materials for the war effort.

Shop production can be increased by intensive study of each operation from the raw material to the finished product. Forgings and castings can be made to closer tolerances and heat treatment used to facilitate machine work and improve the resistance of many parts to wear and failure.

Many tools now on railway budgets will not be delivered until all armament plants are completed and partial replacement available. Without new tools, many machines should be rebuilt and made serviceable either for general purposes or special work. Every machine tool should be maintained at its maximum efficiency and scheduled so that each tool produces the type of work for which it is best adapted.

Conservation ; Including Tool Steels

The most urgent problem at present is the conservation of materials so that the primary producing capacity of the nation is available for total war effort. The ever changing material situation will make different materials critical at different times and the railroads must face this problem with an open mind and with prompt and drastic action.

Among other items which will conserve primary material is the reclamation of locomotive axles and crank pins from larger to smaller classes by Magnaflux inspection, heat treatment and machining. When the final limits are reached the material can be reforged for less important parts.

By similar line of reasoning and action, tool steel can be reforged to smaller sizes and used in improved tool holders. Tungsten is an extremely critical alloy and its use in carbide cutting tool tips vastly increases its utility per available unit. The practice of boring locomotive tires to smooth finish with carbide tools has entirely eliminated the bore crack type of locomotive driving tire failure. Restrictions on tungsten, cobalt, chromium, and vanadium make the subject of tool conservation one of extreme importance.

Improved engineering design must be continued so that the railroads can take advantage of each opportunity to conserve the maximum amount of basic material. For example, the application of light-weight rods and motion-work parts on locomotives will reduce the weight of steel requirements by as much as 30 per cent. Likewise, the use of low-alloy, high-strength steel deserves intensive study to determine the best policy with respect to the total demand on the steel producing capacity of the United States. Further, it must be kept in mind that improvements in locomotives and cars with respect to balance and tracking characteristics are economies in track maintenance.

Be Careful with the Torch

The use of the acetylene cutting torch has in many cases become an extravagant least-resistance sort of habit, rather than a cost-reducing device. The use of the cutting torch should be restricted to the removal of material which is definitely scrap and the destruction of bolts, nuts, washers, clamps and other usable items should be avoided because the destruction of these items increases the load on vital manufacturing plants. The pantagraph torch cutting machine is in quite a distinct category and has its place as a definite labor saving manufacturing tool. In vivid contrast to the injudicious use of the cutting torch, autogenous welding should be more generally used in the construction of locomotives and cars.

Time For the All-Welded Boiler

The all-welded locomotive boiler should be authorized for use on new locomotives and the replacement of boilers, which are now causing heavy expenditures for repairs, on account of unsatisfactory riveted construction. Welding methods are beyond the experimental stage, heat treating and inspection facilities are available and the conservation of steel-making capacity demands the elimination of unnecessary rivets and joint cover plates. The record of the Delaware & Hudson ex-

perimental boiler shows the futility of further delay on this development.

What the A. A. R. Is Doing

Studies are now under way under the direction of the A. A. R. and with splendid co-operation from manufacturers, to reduce the use of copper and copper base alloys, tin, zinc, lead and rubber. Again we are faced with the changing situation as illustrated by restrictions on galvanizing to conserve zinc, which has already increased the demand for lead base paints to an unexpected degree. A fine sense of balance must be maintained to allow a constant shift in paint pigment and vehicles depending on the immediate situation. As the rubber situation becomes more acute the multiple V belt must give way to the self-adjusting flat leather belt or geared drives on machine tools, air compressors.

The demand for solid fuel by power-generating stations and industry, require the use of many additional cars which can be partially offset by a more intensive practice of fuel economy in heating plants and on locomotives. Fuel economy starts at the mine and must be vigorously policed until the ashes are dumped where they are useful and not a nuisance.

A system of scheduled freight-car inspection and maintenance which reduces the average number of bad order cars one per cent will be equivalent to building 18,000 cars for the American railroads.

Schedules—Wrong Kind or Right Kind?

Most schedules are made on a time basis whereas the important thing is sequence of operations

By T. E. Hickey,
Houston, Texas

In order to improve on any type of operation it is essential that the present methods be thoroughly understood.

The locomotive to be repaired is brought into the shop, after being disconnected from its tender. In some instances the bricks have been removed from the firebox, jackets removed from the cylinders, and the superheater units examined, but in other cases the locomotive is placed in the shop immediately after coming in from its run. In either case the first big job is to take the locomotive off its wheels and place it over a pit. While the preparations are being made to remove the wheels, other work is also going on in the cab and at the front end.

Locomotive Dismantling Procedure

In the cab, the carpenter and helper are removing the seat boxes, and are trying to remove the curtains, awnings, doors and windows. At the same time, air men are trying to remove air valves, disconnect air gages and remove various pipes. Another mechanic is attempting to remove steam gages and water glasses. The electrician and his helper are removing light shades and unfastening the flexible conduit from the jacket. In addition, a mechanic and his helper are usually trying to remove other work. This method can only result in confusion and a slowing up of the work.

How should this work proceed?

First, let the carpenter and helper remove the seat boxes, curtains, windows, etc., from the cab while other men are working on some other part of the same locomotive, or on some other locomotive. The next thing should be the removal of the steam and air gages. This should be followed by the removal of the electrical equipment, then the air work, then the pipe work and finally by the removal of jacket and lagging. Of course, some of this work would not be finished until after the locomotive was placed over the pit. All the other parts of the locomotive could likewise be properly scheduled for the sequence of operations and the entire locomotive dismantled in this manner.

After it has been dismantled and the parts properly examined for defects, then a repair and assembly schedule should be worked out. This should be carefully done so that conflicts with the repair and assembly schedule of other locomotives and equipment in the shop can be avoided.

The practice at present is to work up a time schedule for the repair of the parts and partially for their assembly on the locomotive. The main difficulty with the time schedule is that it does not fit with the sequence of operations, or sequence schedule. The other difficulty with the time schedule is that it is not adhered to. The remedy is to work out the sequence schedule first, and base the time schedule upon it.

Several things should be carefully considered when working out the repair schedule:

1—Have the proper blueprints and specifications available. Good blueprints may be expensive in the drafting room, but they are money, time and material savers in the shop. Do not expect good, fast workmanship unless the proper blueprints and specifications are at hand.

2—Improvements and changes to be made on the locomotive should be known as soon as the locomotive is in the shop for repairs. In this manner parts that are no longer going to be used can be cleaned and used for other purposes, or scrapped as the case may be.

Not only can this work be scheduled in this manner in the Locomotive Department but also in the Car Department as well, thus putting the entire Mechanical Department on a sequence schedule basis.

Of course, the working out of the first few sequence schedules will be a big task and is likely to cause some confusion in the departments, but it will be worth the effort. In fact, the first schedule will have to be changed quite a bit before anything like a workable one can be had, but if one is worked up carefully, the following results may be expected: (1) better work will be done; (2) work will be speeded up without tiring the workmen beyond their ability; (3) material will be saved, and (4) safety records will improve. It is a well known fact that fatigued workmen, crowded conditions and rushed work makes for the increase of accidents. Remove these causes and accidents will decrease.

Simplified Method of Firebox Repair

A detailed description of the shop facilities needed to do a difficult job easily

By E. H. Heidel and H. W. Chandler,

Chicago, Milwaukee, St. Paul and Pacific, Milwaukee, Wis.

The repair of large locomotive boilers, and particularly those on modern high-pressure locomotives, has placed a heavy burden on the average railroad boiler shop, few of which are equipped with entirely adequate machinery for the manufacture and fabrication of replacement parts for fireboxes and boiler shells. The hydraulic press plays an important part in the boiler shop, and with the proper dies and formers a considerable variety of work can be handled.

As an example of the foregoing, the manufacture of inside throat sheets on an open front hydraulic press of 200-ton capacity and in a range of sizes to accommodate all combustion chamber boilers on the railroad has been accomplished, in the manner described here.

Inside throat sheets ordinarily require repairs in the vicinity of the throat sheet "ears" long before the body of the throat sheet requires renewal. This fact led to the manufacture of throat sheet ear patches under the hydraulic press, two ear patches for opposite sides of the boiler being formed in one operation on a simple set of blocks. A set of ear patches for right and left sides of the boiler is shown in Fig. 1, and the blocks used for their manufacture are shown in Fig. 2. It will be noted that considerable variation can be made in the width of the patch, and the one throat sheet ear pressing has been successfully applied to all classes of locomotives on the railroad employing a combustion chamber with little or no alterations. After being properly fitted up, the throat sheet ear patch is butt welded to the crown sheet, side sheet, throat sheet, and combustion chamber sheet, after which the patch is adequately stayed by the application of the usual rigid and flexible staybolts.

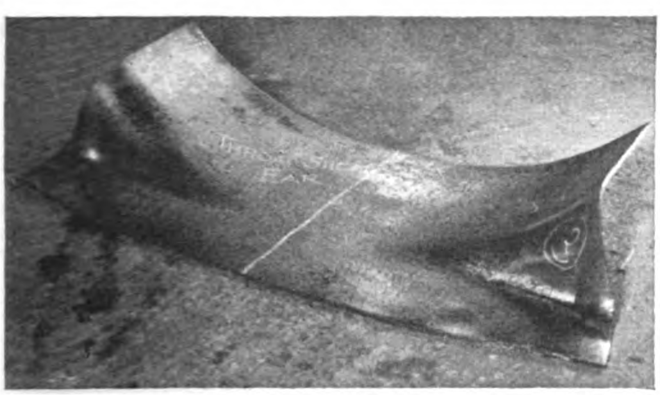


Fig. 1

The successful use of a large number of ear patches over a period of years indicated the feasibility of applying inside throat sheet and throat sheet ears separately when renewing the throat sheet. This materially simplifies the manufacture of the inside throat sheet and its application to the firebox, as well as effecting a saving in material. Flange blocks for forming the inside throat sheet are shown in Fig. 3 and the blocks in place on the hydraulic press are shown in Fig. 4. It will be noted that one ram of the press is used first to form the bend in the lower part of the throat sheet and subsequently to hold the sheet in place on the bottom block, while the breaking-down block on the second ram forms the throat of the sheet. In a number of cases, a small variation in the throat sheets formed on a set of these blocks will adapt the sheet to another class of boiler.

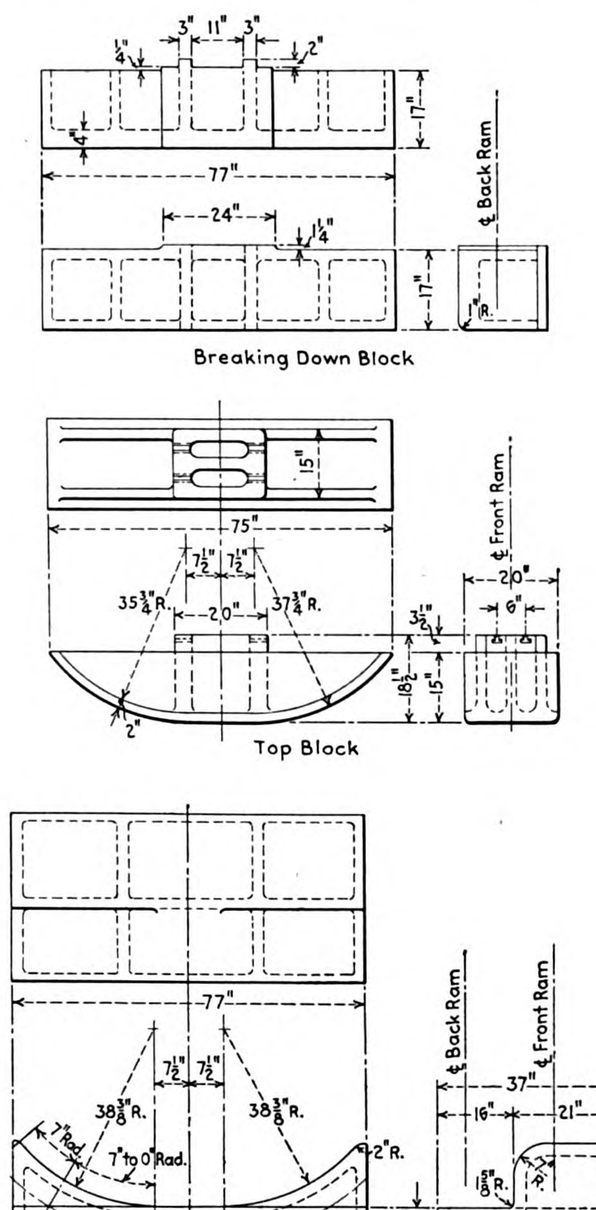


Fig. 2

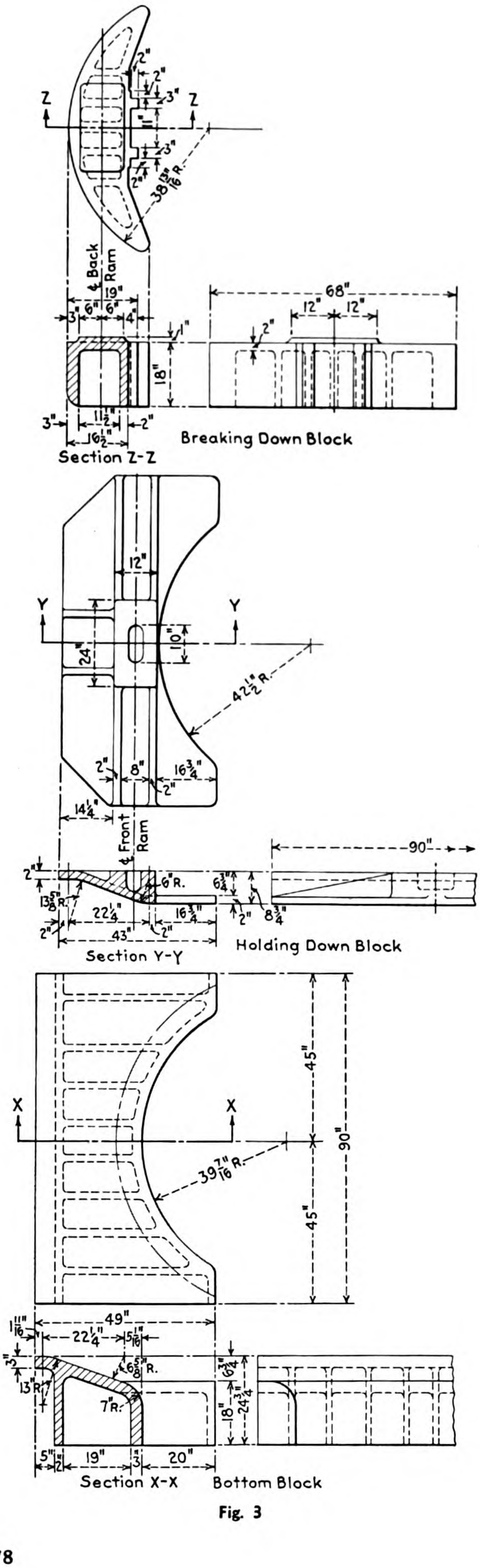


Fig. 3

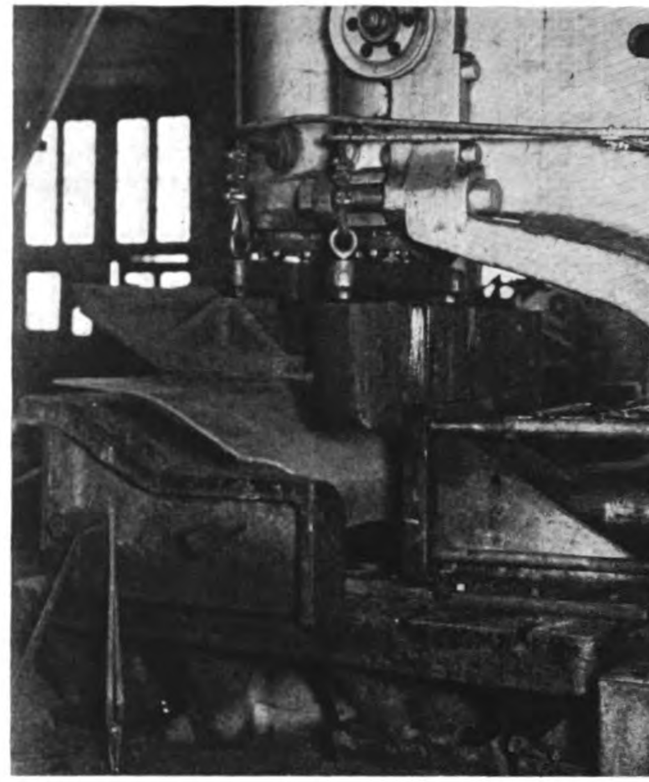


Fig. 4

As a by-product of this method of flanging throat sheets, the transition from riveted seams to welded seams in the firebox is simplified for the reason that provision is made in the forming blocks for long flanges, permitting the location of the welded firebox seams between two rows of staybolts. All lap seams and double thicknesses of firebox sheets are thus eliminated. On one class of freight locomotives having a particularly short combustion chamber, the long flanges on the inside throat sheet, the throat sheet ears, and the back flue sheet has made possible the elimination of the combustion chamber sheet, the long flange of the throat sheet being welded directly to the flange of the back flue

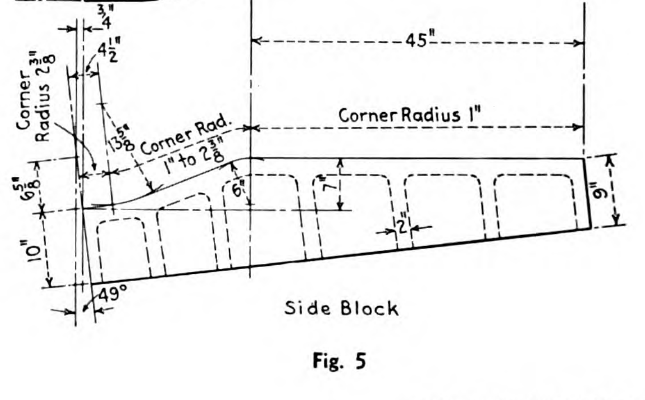


Fig. 5

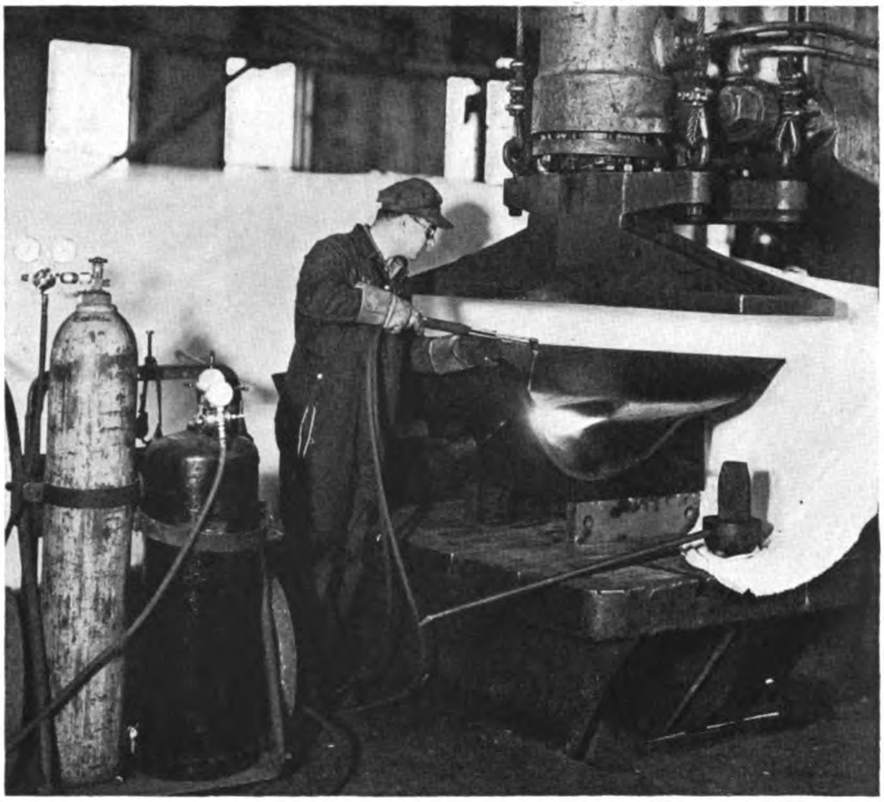


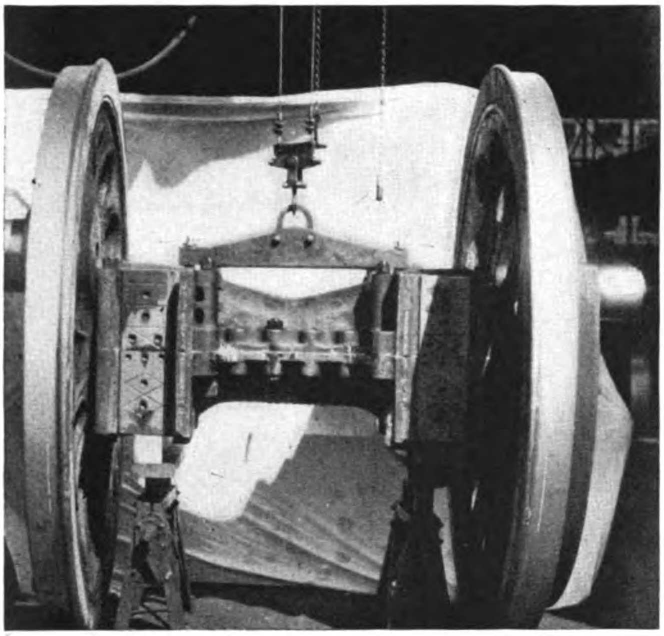
Fig. 6—Forming the syphon neck opening with a ball die in the hydraulic press. The heating is done locally with an acetylene torch

sheet. In the case of a throat sheet finished with the long flange which can be welded directly to the back flue sheet flange one weld is eliminated.

The throat sheet side flange is formed under the hydraulic press by using the side block shown in Fig. 5, and the same breaking-down block which is used for the throat sheet ear pressing. Throat sheets for syphon-equipped boilers have the syphon neck openings formed in the sheet by pressing a ball die through the sheet and into a suitable block, which is standard for all classes of syphon-equipped boilers. In this operation, shown in Fig. 6, the throat sheet is set up in the press and heated locally by means of an acetylene torch. This method simplifies the handling, reduces the time required for the operation, and the sheet is not warped. A throat sheet patch complete with syphon neck openings made in the above manner is shown in Fig. 7. The process described eliminates considerable hand flanging.

Fig. 7—A throat sheet patch, complete with syphon neck openings, which was made in the manner described in Fig. 6

Practical Ideas From Practical Men That Make Hard Jobs Easy



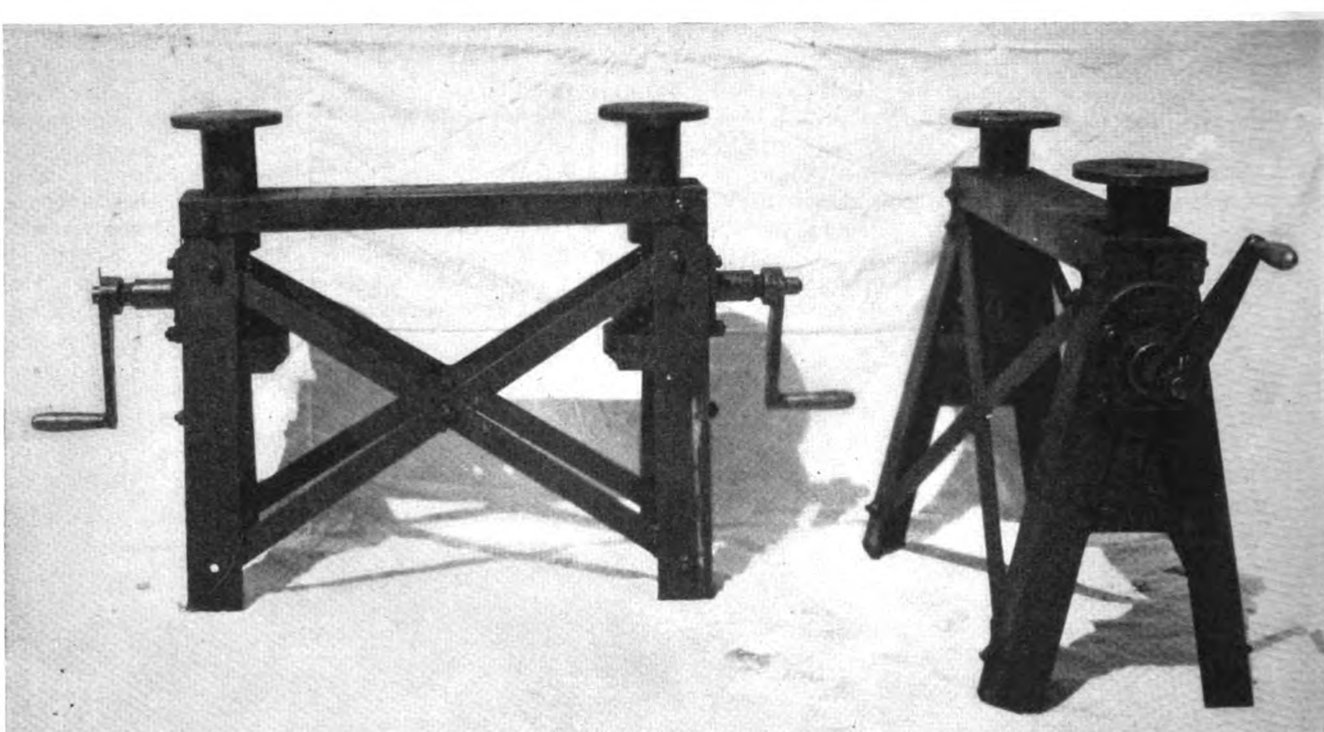
Devices for handling roller bearing axles and boxes

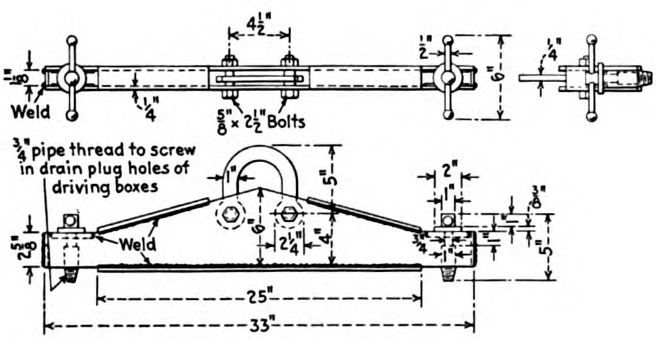
By J. R. Phelps,
Machine Foreman, A. T. & S. F., San Bernardino, Calif.

[The shop kinks on this and the following three pages are selections from a large number submitted as contest entries by Mr. Phelps. Others will appear in subsequent issues—Editor.]

The handling of driving wheels and axles, where equipped with roller bearings, has injected into locomotive shop work the necessity of developing a number of new and original devices for simplifying the work and protecting the finely finished surfaces.

Fig. 1 (Top)—Wheel set as removed from locomotive with lifting sling in place; Fig. 2 (Center)—Side and end views of lifting jacks; Fig. 3 (Bottom)—Detail of sling showing method of attachment





Not the least important part of the job is the dismantling of the wheel sets in order that the axles, boxes and bearings may be carefully inspected. The photographs on this and the opposite page show a method and the devices with which this job may be done.

In Fig. 1 the wheel set is shown as it came from the locomotive, after having been thoroughly cleaned. The wheel set is mounted on the lifting jacks, one of which is shown in Fig. 2. These jacks are shop made with structural framework and screw-type heads which have been made from jack parts. The head screw drive is through bevel gears. The jacks, when placed and the

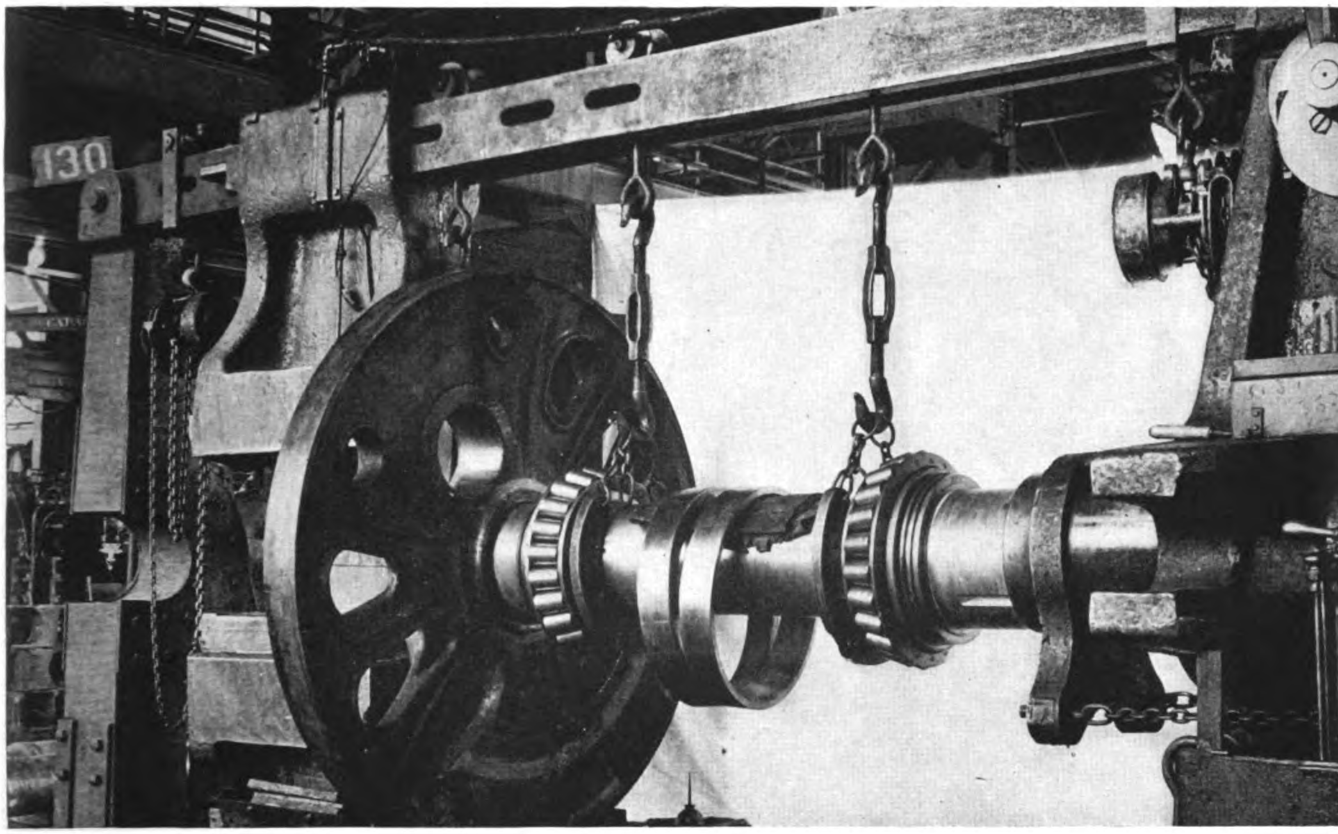
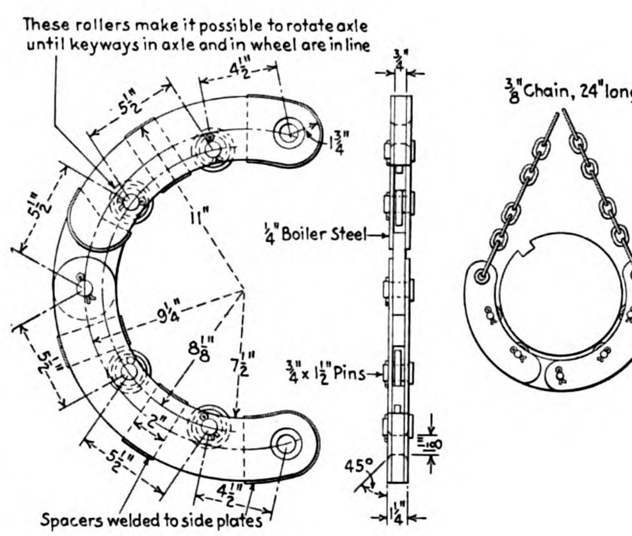


Fig. 4 (Top)—Roller bearing driving wheels in wheel press with boxes removed, showing roller-type sling attached for lifting axle; Fig. 5 (Center) — Drawing of the roller sling; Fig. 6 (Bottom) — Clamp for turning lower half of box

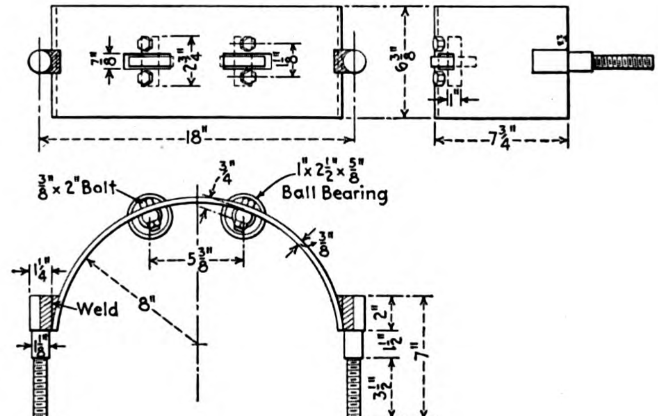


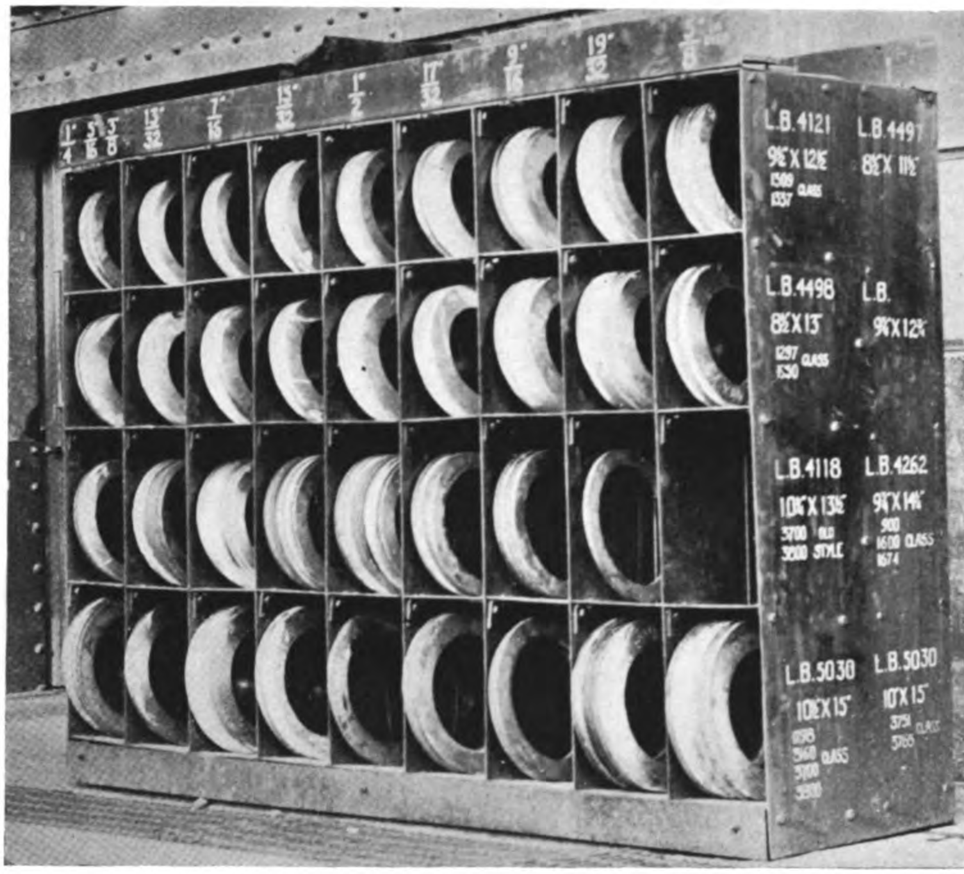
heads run up, put the entire weight on the jack heads and blocking and the bolts, holding the two halves of the box together, are removed. The lifting sling is fastened in place by the insertion of the special bolts in the drain-plug holes of the box after the box has been rolled over on the axle. Then the top half of the box is lifted off.

Owing to the fact that the bottom half of the box can not be lowered to the floor because of interference with the counterbalance it is necessary to lift it off. So, the clamp, shown in Fig. 6, was designed to be inserted in bolt holes of the bottom half and drawn down until the rollers are in contact with the axle. Then the bottom half is rolled over, the lifting sling attached, the clamps removed and the half box lifted off.

Roller Sling For Lifting Axles

Figs. 4 and 5 show a metal roller-bearing sling for holding driving axles of all types at the wheel press. During the wheel-press operations it is necessary to roll the axle around in order to line up keyways and this must be done in such a manner that the finished surfaces are not marred in any way. The sling shown here makes it easy for the wheel-press operator to perform this operation with one hand. The sling is constructed of ¼-in. boiler steel, with a hinge located in such manner that the rollers can adapt themselves to a variety of axle diameters. The sling side frames are held by welded spacers and the hardened and ground rollers are secured in the frames by ¾-in. by 1½-in. pins.





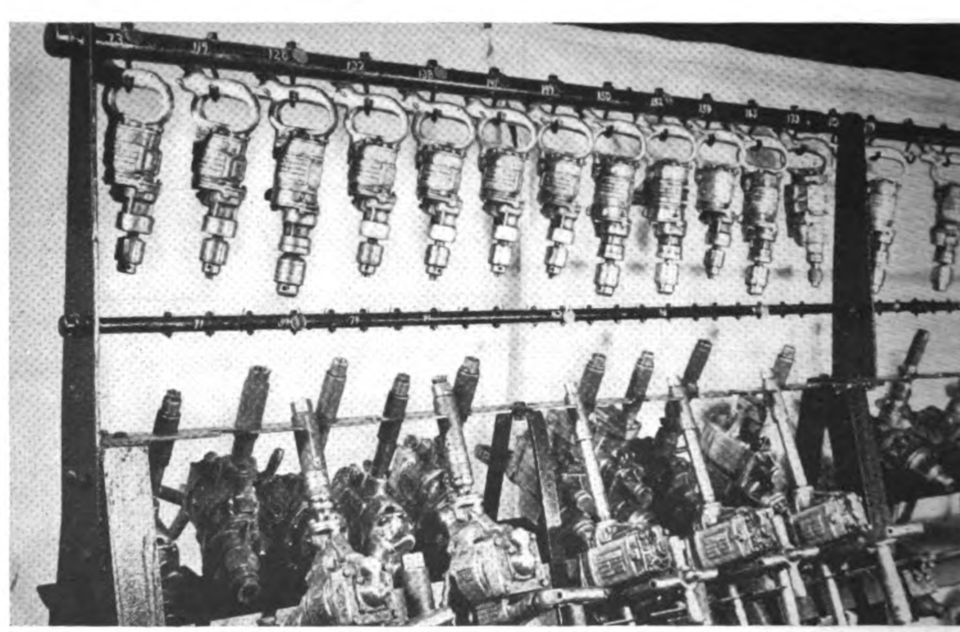
Rack for holding brass eccentric lateral liners

Racks Make It Easy To Find Things

The photograph at the top of this page shows a bin-type rack for holding eccentric liners. The rack is double, being open on both sides, each side having 36 separate bins, a total of 72. Each of the eight rows contains liners of a given bore and diameter but each of a different thickness. All liners in the bins to the right of the picture are ⅝-in. thick and each bin, from right to left, contains liners $\frac{1}{32}$ in. thinner than the adjoining bin. This makes it possible for a floor machinist to get a liner of exactly the required thickness without waiting to have it machined.

The back of each bin is 1 in. lower than the front so that the inclined bottom will cause the liners to roll into the bin and not out on the floor. At the top of each vertical row is a slot gage which simplifies the job of checking the thickness of the liner selected. The engine class, bore, outside diameter and pattern number is stencilled in white on the ends of the bins.

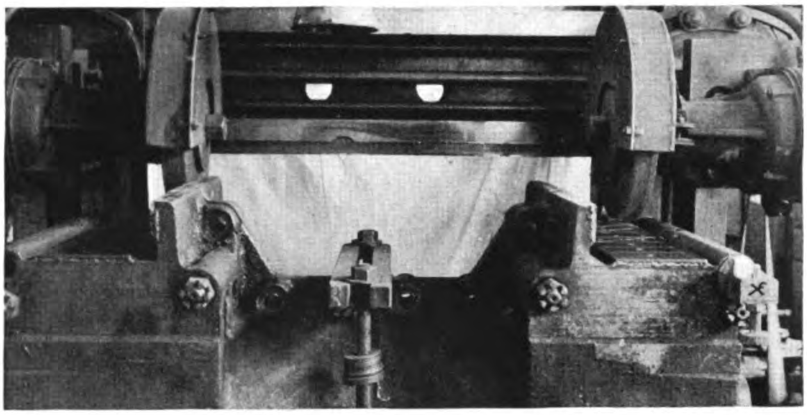
The photograph below is an air-tool rack holding 23 small drills and 41 large drills. Each tool has a number and when the tool is gone from the rack a check bearing that number must be in its place. This provides a simple and effective tool check system.

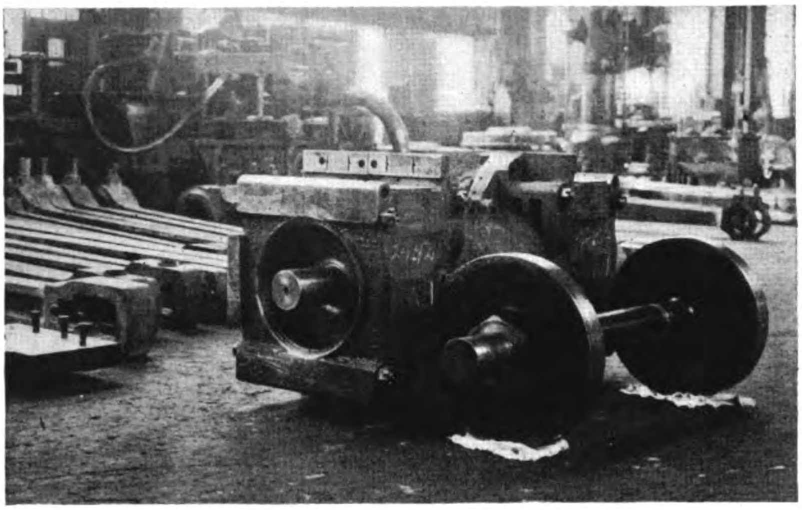


Rack for storing and checking the location of air tools

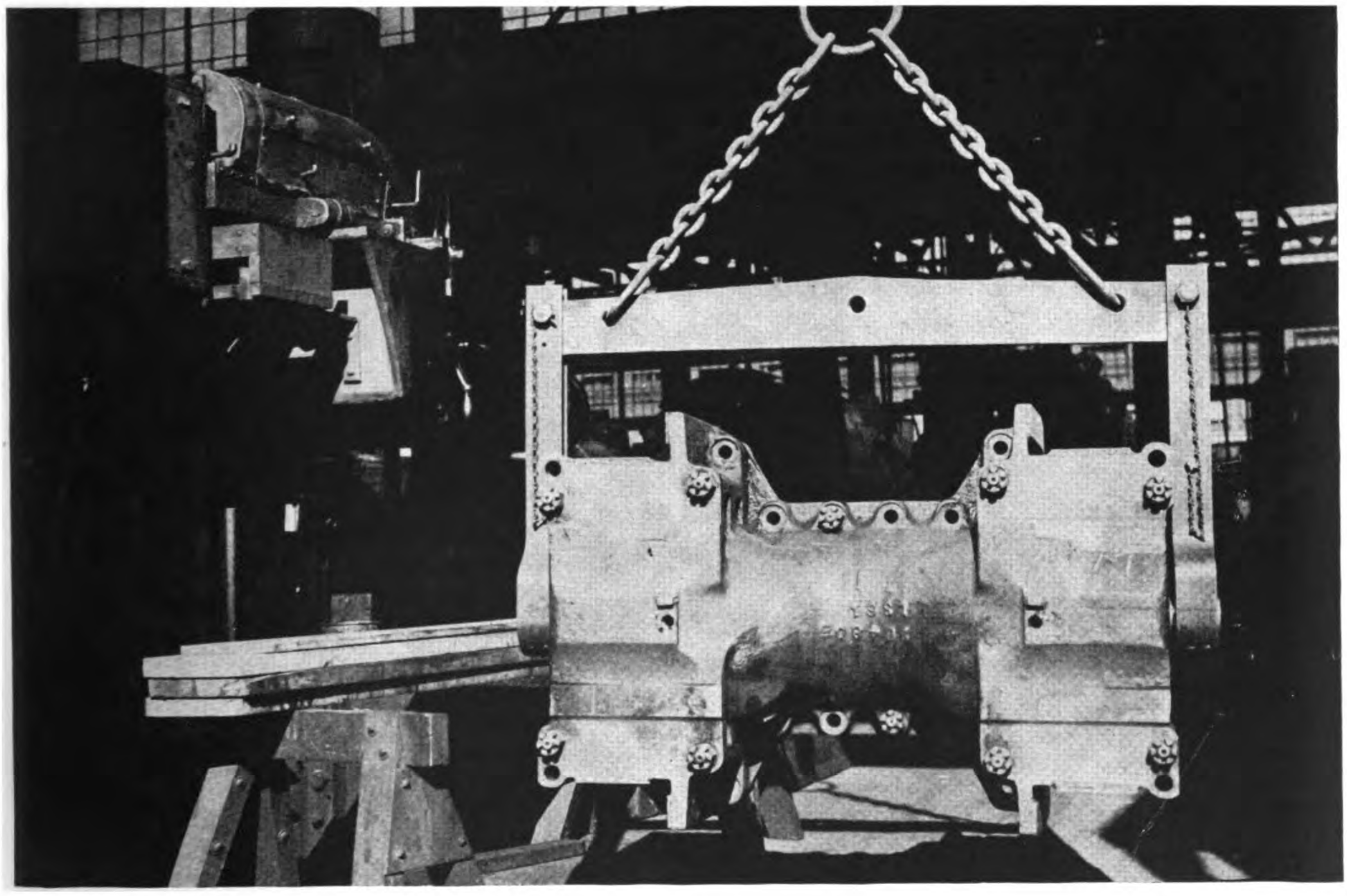
Grinding Hardened Shoe Faces

The grinding of the hardened shoe faces on the driving boxes shown is done on an old planer driven by two 5-hp. motors which have been converted into grinders. The arbor in the center of the driving box is used to set up the driving box on the table so that the center of the driving box at both ends is the same distance above the table and to make sure that the box is ground so that the shoe faces are the same distance from the center of the box. This last is accomplished by drilling a 3⁄16-in. hole at the center line of the box on the joints. Then the machinist takes the measurements at this point, using a micrometer depth gage. Care must be used in clamping the box down on the table to avoid springing. Although the driving boxes are large and heavy, inaccuracies due to springing will occur if they are not properly clamped down. Using the arrangement illustrated makes it possible to grind the two faces on one side of a box at the same time with increased accuracy and a considerable saving in time.





Top — Converted planer with grinders for finishing shoe faces of locomotive driving boxes
Center — Arbor used in grinding boxes which insures maximum accuracy in machine operation
Bottom — Sling for lifting boxes onto planer table and for positioning and turning boxes



Depression Experience of Value in Present Emergency

By L. M. Westerhouse,
St. Louis-San Francisco, Birmingham, Ala.

During the depression years those of us who are employed in a supervisory capacity found it necessary to take advantage of every opportunity and means to economize on material and labor in order to stay within our budget.

In the scrapping of obsolete equipment it was possible to salvage much material that could be used again. Speaking specifically of locomotive tires, there are various condemning limits for driving tires, due to the different classes of service and sizes of locomotives. This makes it necessary to change the tires on some classes of power more often than on others but, on the other hand, the tires removed can be used again on other power until they have reached a final condemning limit. In some cases it has been possible to use a set of tires having a larger outside diameter than the original specifications for the locomotive in order to get longer service.

How to Save Tire Metal

In the re-turning of driving tires, valuable material can be saved by culling out from a set one or two tires that have a badly worn flange and replacing them. The life of driving tires can be greatly prolonged by using proper care in locating the main centers when laying off the shoes and the wedges, thereby eliminating causes for flange cutting, and by providing and maintaining some form of flange lubrication on the flanges of the leading wheels. Considerable material may be saved by accumulating an assortment of various sizes and thicknesses of used tires. This is possible by replacing a set of worn tires which has had one or two turnings with new tires, using the old tires for replacements and in matching up other sets. By accumulating all old tires of various thicknesses the tires can be classified and held for individual replacements. The larger the stock to chose from the less service material need be removed in returning the tires for various replacements.

This plan is more or less applicable with various types of truck wheels.

Provide Generous Fillets—Avoid Tool Marks

The provision of generous fillets and the elimination of tool marks is an important subject. This offers a good field for extending the life of various parts and aids greatly in avoiding failures from progressive fractures. An example of this is the elimination of the shoulder from the crosshead end of a piston rod by having the bore of the crosshead piston-rod fit considerably larger than the body of the rod and having all of the fit within the crosshead. Then a large radius extending from the fit to the body of the rod distributes the vibrations over a greater area and along the body of the rod.

Step-Size Suggestions

Material and labor can be saved by constructing the wearing parts of piston rods, crank pins and axles slightly oversize on the original application and then using these parts on smaller power or in other places when it has finally reached the condemning limit. There is also an advantage in having a variation in the size of the crank pins and rod eyes on one side of the locomotive from the other, in order that bushings on one side when worn to the limit, can again be used on the other side. However, the same results can be obtained by having a wide range of condemning limits on pins and rod eyes, and then save all the bushings that will return and rebore and only use entirely new material where the most stock is required.

The reclaiming of piston valve packing rings and cylinder packing rings, especially the sectional type, has provided a profitable field for savings in material. By the use of a special clamping device many may be returned to a smaller size. In order to make this possible to the greatest extent, it is important that as much variation as possible be provided from the original size, to the condemning limit, for the bore of the bushings. This is possible by starting out the original bore of valve bushings a little under size and replacing them only when they have reached a limit whereby they can no longer be rebored. Rings that still have some stock, but have been removed because of wear or being cut, can be classified, stored and re-turned to the next size below. Thus, only entirely new rings need be used on those bushings having been bored close to the condemning limit and only the rings that have finally reached the smallest size possible need be scrapped.

Valve bull rings and cylinder bull rings may be handled in the same manner. If valves and cylinders are properly lubricated, the replacement of worn valve and cylinder packing rings can be greatly reduced and much work of reboring valve bushings and cylinders can be eliminated.

Machine Tools Important in Railroads' War Efforts

If maximum production is to be obtained existing machine tools must be maintained and supplemented by the addition of available new equipment. The following excerpts from contest papers emphasize these points.

Keep Shop Machinery Tuned Up

(1) Put machine and shop equipment in as good a condition as possible; (2) relocate machinery, when necessary, so that work may be moved through the shops with the least time and resistance; (3) discard any obsolete equipment and replace with tools of modern design, if available.—*David E. Anderson, machinist helper apprentice, Northern Pacific, St. Paul, Minn.*

Don't Let Machine Tools Run Down

Most shops have departments expressly for the purpose of maintaining shop equipment but usually it is only after machines have failed from excessive work that these departments are called in. Perhaps the old adage "A stitch in time saves nine" could be used here to remedy this situation. If an efficient inspection department could be organized that would make expert examinations of shop machinery and provide for the proverbial stitch in time, it seems that many unnecessary machine failures could be prevented, thereby greatly reducing the drain on replacement parts thus again aiding national defense. This too would be a mutual benefit and the railroad companies would avoid expensive and exceedingly slow machine tool replacements.—*L. H. Booth, assistant mechanical inspector, Chesapeake & Ohio, Richmond, Va.*

From Tires to Housekeeping

Three papers, not readily classifiable—Pooling of surplus shop facilities and shop cleanliness among suggestions offered

SEVERAL of the papers submitted in the competition were so written that they could not be readily assigned to one of the groups dealing with a single specific aspect of mechanical-department responsibility. Some discussed too many of these aspects to belong exclusively to any of them. One touched on a field in which it stands quite alone among the papers entered in the competition.

Good housekeeping in and around the shop is not a new subject. But in the very fact that it was pretty thoroughly discussed during the days when the safety movement was being developed, and is now a matter for routine treatment, lies the danger against which one author sounds a warning. What the writer of another paper proposes to accomplish by pooling surplus shop facilities has already proved helpful in a number of instances. No doubt such arrangements will continue to be developed wherever circumstances justify them.

Wearing Qualities of Road Locomotive Tires

Studies made of performance of several groups of locomotives show influence of carbon content on service life

By C. P. Brooks,

Melrose, Mass.

The following data are a brief study of the carbon content of locomotive driving tires and how, by selecting tires with a higher carbon content and without subtracting from the safety factor, more mileage and less frequent turnings on account of tread wear may be obtained from a set of tires.

The characteristics of the locomotive from which the data were obtained are set forth in Table I. There were nine of the 4-6-2 passenger locomotives, four with Grade A tires with a carbon content of 57 to 59 carbon and five with Grade B tires with 71 to 73 points carbon. These locomotives will be referred to as the "P" class. Five of the 2-8-4 type freight locomotives were studied, two with Grade B tires with 72 to 75 points carbon and three with Grade C tires with 75 to 77 points carbon. These locomotives will be referred to as the "T" class.

Table I — Characteristics of Locomotives on Which the Tire Wear Was Studied

	4-6-2 Passenger	2-8-4 Freight
Wheel diameter, in.	80	63
Total weight on drivers, lb.	210,000	253,000
Average weight per axle, lb.	70,000	63,250

A study was made of four P class locomotives equipped with Grade A tires. The carbon content ranged from 57 to 59, placing them well within the Grade A class. At the time of tire renewal on these particular locomotives, the tires had run up an average of 189,655 mi. per locomotive.

A comparative study was made of five P class locomotives equipped with tires having the higher carbon range, which placed them in the higher ranges of Grade B and the lower ranges of Grade C. At the time this study was made, these tires had run up an average of 148,300 miles per locomotive, and the tires still had an average of 5/8 in. of surface metal before reaching limit of last turning. Note that the miles per unit of tread wear of the Grade B tires on these locomotives is 215 percent greater than that of the Grade A tires.

Table II—Summary of P Class Locomotive Tire Performance

Grade of tire	*A*	*B*
Carbon content	57 to 59	71 to 73
Original thickness, in.	3 3/8	3 3/8
Average wear when removed or studied, in.	1 1/8	13/32
Average mileage	189,653	148,290
Miles per 1/32 in. of tread wear	5,270	11,410

A study was made of two T class locomotives equipped with tires having a carbon range of from 72 to 75, placing them in the higher ranges of Grade B and the lower ranges of Grade C. At the time of renewal, these tires had run up an average of 47,756 mi. per locomotive.

The other T class locomotives were equipped with

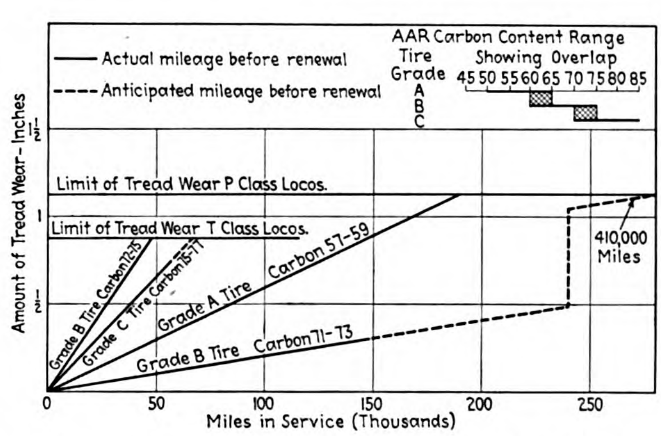


Chart summarizing experience with various grades of tires

Table III — Summary of T Class Locomotive Tire Performance

Grade of tire	*B*	*C*
Carbon content	72-75	75-78
Original thickness, in.	3⅛	3⅛
Average wear when removed or studied, in.	⅞	¾
Average mileage	47,756	56,900
Miles per 1/32 in. of tread wear	1,700	2,310

tires within the Grade C group. At the time this study was made, these tires had run up an average of 56,900 mi. per locomotive, and the tires still had an average of ⅛ in. of surface metal before reaching limit of last turning. The miles per unit of tread wear of the Grade C tires on these locomotives is 136 percent greater than that of the Grade B tires.

Throughout this paper, flange wear has been discounted as depending on other variables. All surface metal removed, on the tires studied, during reforming operations has been accounted for in the rate of tread wear.

Emergency Requires Full Use of Present Equipment

Pool surplus equipment and shop facilities—Share ideas

By W. T. Clark

The mechanical departments of the railroads of the United States and Canada are facing an emergency. As a vital unit in the national defense program, the railroads must meet the heaviest tonnage demands in their history with the equipment they now have and the additions to it that can be obtained under permitted priority orders.

The railroads have just passed through a decade of lean years, during which every possible operating economy was employed. Many shops have obsolete and worn machine tools which need replacement. There are enginehouses and shops too small properly to handle the motive power coming into these terminals. Engines are being turned on wyes, because the turntables are too small. Car repair tracks are often undermanned and without adequate equipment to handle repair work promptly. There are shortages of engines and cars.

The men of the mechanical departments, because of these conditions, are presented with a tremendous responsibility and they are the ones who must devise the ways of handling the emergency. The railways of the North American continent are a closely interlocked system of transportation. If any unit of this system fails, it will affect the performance of the whole system. Because of this condition we have a joint interest, and to get the results that we must have, we will have to work together. Let us put our own house in order this time. The last time some one else took over the job, the results were not very desirable from anyone's viewpoint.

Pool Surplus Equipment and Shop Facilities

Divide the country into several convenient districts, similar to the present Interstate Commerce Commission set-up, and form a committee in each district made up of representatives from the roads in that district. Have each road supply information on all serviceable equipment, and all equipment that can be made serviceable within a reasonable period of time. Also, have each road list their requirements at the present time, and what they believe they must plan for in the future. Each road will also give information as to its shop capacity, the present output of its shops, and the work that could be done if necessary. The committees will work out a plan by which a fair return will be paid to the owner of any surplus equipment, and the equipment will be placed where it will give the best service. The same method may be followed for the use of the extra shop facilities that may be available. By this arrangement idle equipment could be put to work at once.

These district committees could also serve as a means of distributing information relative to the shop practices employed in the different shops of their territory. One shop may have a new kink on straightening steel car ends, or handling mounted wheels. Another may have a method of handling and servicing engines that will save valuable minutes. Let this kind of information be made available to all in our industry, for there are very few of us who cannot learn something from others.

This plan presents a number of difficulties which will mean much work for management and there will be details to work out to satisfy all concerned, but it can be made to work with benefit to all if properly handled.

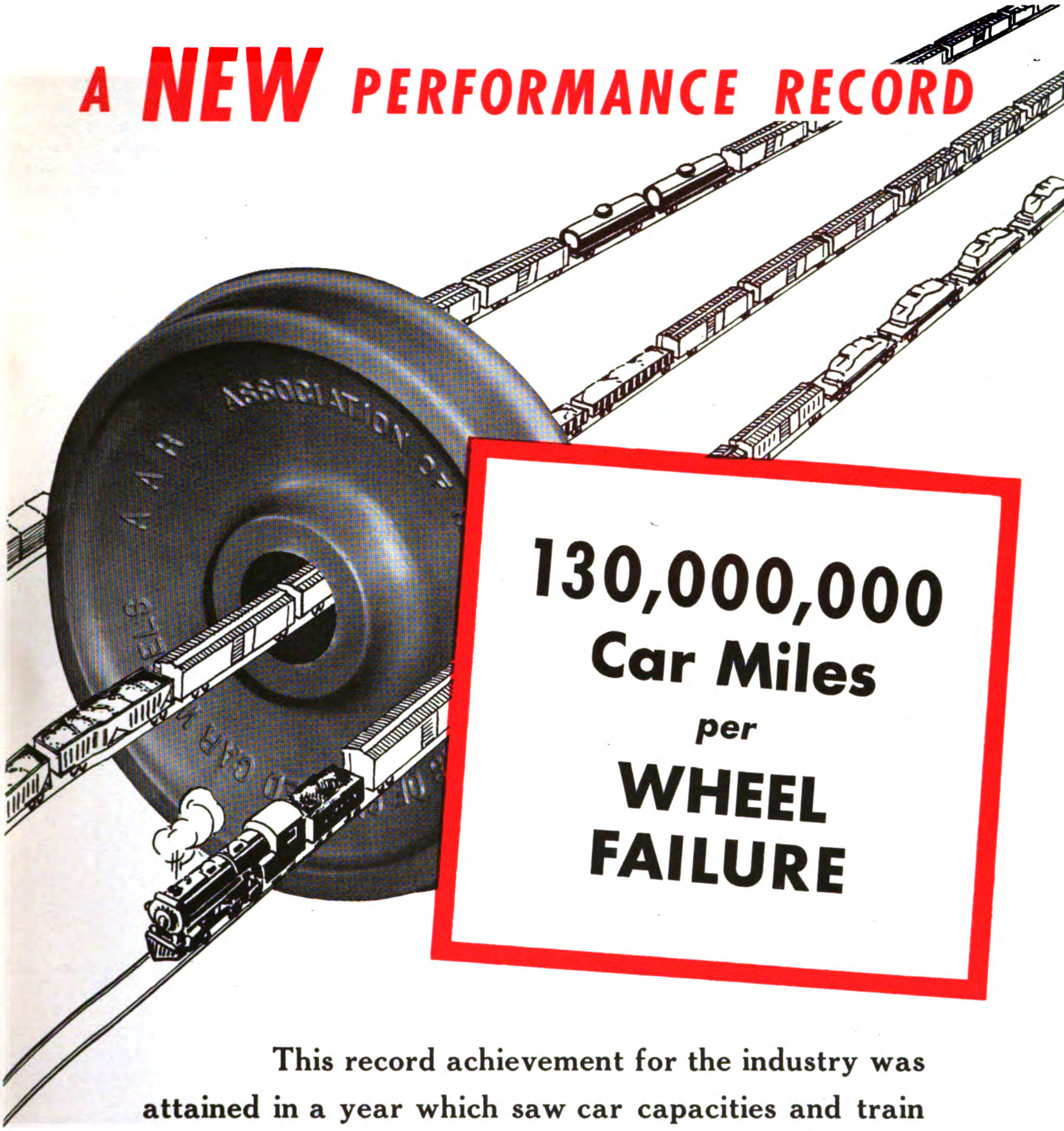
Increase Locomotive Mileage

After the best possible distribution of the available equipment has been made, we must take the steps necessary to get every possible mile from each unit. There are roads that are now getting from 7,000 to 9,000 miles per month from modern freight power, and a performance closely approaching this figure from engines 20 to 25 years old that have been modernized. Such a performance as this is no happy accident, but is the result of careful planning by capable supervisors. To get a locomotive mileage of this standard the crews handling the equipment must be thoroughly trained to get peak performance from their engines; the enginehouse crews must be drilled to cut handling time to a minimum; and the engines must be properly maintained.

When the mileage performance mentioned above is compared with the average engine performance the country over, it is clearly apparent that we are not getting the mileage possible with the equipment we now have, and if the proper steps are taken to obtain this available mileage, the present emergency will be greatly relieved.

To get comparable mileage from older power, the tenders of most of them must be rebuilt for greater coal and water capacity; they should be equipped with mechanical lubricators; and the valve and driving gear should be fitted with pressure-type lubrication to make long runs possible. If the pressing need and the results that can be obtained by the use of the material is presented to the authorities controlling the distribution of critical materials, it should be possible to get supplies for this work. The methods employed to get high mileage performance are no secret. The means used by different roads have often been discussed at the various

(Turn to next left-hand page)



This record achievement for the industry was attained in a year which saw car capacities and train speeds increased to the highest levels ever attained.

It is final proof of the progress already made towards our ultimate goal—"to make every wheel as good as the best."

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

230 PARK AVENUE,
NEW YORK, N. Y.

445 N. SACRAMENTO BLVD.,
CHICAGO, ILL.

AMCCW

ORGANIZED TO ACHIEVE:
- Uniform Specifications
- Uniform Inspection
- Uniform Product

mechanical conventions, and many articles on the subject have been given in the *Railway Mechanical Engineer*. The methods used are governed by local conditions and traffic demands, and must be worked out by the supervisors in charge.

Better Training and Cooperation Required

To get high locomotive performance and mileage, there must be thoroughly trained crews handling the equipment on the road, and servicing the equipment at the terminals. The importance of personnel training in any program of improved performance cannot be emphasized too much. On any division train sheet you may choose to check, you will find certain engine crews giving a consistently better performance than the average in time and train handling. If you ride with these crews, you will find two men who thoroughly understand their engine and their duties. You will find two men working together as a team.

Monthly meetings held with as many enginemen and firemen as can attend have been found of much help in improving performance on one mid-western railroad division. The meetings are usually spaced over two days with two meetings each day. Mechanical troubles, and good and poor train performance experienced by the men are talked over. Everyone has the privilege of talking, and ways and methods are discussed of how these mechanical troubles and poor train performances could have been avoided. At these meetings, supervisors of different departments, air brake, boiler, and mechanical, give talks on handling equipment, and explain the operation and possibilities of new equipment.

That this method is producing results is clearly shown on the records. Thirty new firemen have been added to the roster in the past nine months and this division's fuel performance is the best of any on the system, and there has not been a steam failure caused by these new firemen. The draft-gear failure record of this division is one of the best of the system. The motive power used ranges from 30-year-old hand-fired to the latest type modern locomotives. This method means extra work for the engine and mechanical supervisors, but very gratifying results can be obtained by its use. For if we are to get the performance on the road that we must have, there must be an intensive campaign of education in their duties for both the old and new engine employees. Enginemen must make better time and handle their trains more smoothly. Firemen must do a better job on the road and bring in better fires which helps to cut engine handling time at the terminals. By better time on the road and quicker handling at the terminals we save minutes, and every additional minute an engine is available for service is the equivalent of another engine for that length of time.

We now have better engines and cars on our drawing boards, and there are now machine tools developed with much greater capacity than our present shop equipment. If we could get this equipment in the amounts we need, there would be no emergency. But the job must be done with what we now have.

Shop Cleanliness Increases Production

Good housekeeping pays dividends in materials — in full utilization of facilities—in decreasing time losses due to accidents

By W. A. Faris,

Material inspector, Norfolk & Western, Roanoke, Va.

During these days of national emergency we are all under pressure to do more and more work. In most cases, new machinery and additional skilled personnel are not available, even when budgets would permit their use.

One tendency under these circumstances is to permit our housekeeping to lapse because we are just too busy to keep things properly cleaned up. Our usual janitor force is being pushed into service on other jobs, and we just don't feel that we have time to clean up the ever-increasing amount of waste that speeded-up production forces on us. It is very easy to push that little bit of trash back into a corner, to set that new bushing over into the edge of the aisle, to drop that old bolt or piece of pipe on the floor, rather than to see that they go where they belong at the moment. Soon our poor housekeeping becomes a habit; we walk through our shop stepping over material without thinking about it and wondering where we will have to start looking to find the odd size tool that we now need and should have returned to the toolroom last week.

Is it really economy in the long run to neglect the apparently less important task of keeping things in order? All the experience that we have had points to one conclusion; that, other things being equal, the shop that is kept clean and orderly does more work, does better work and is a much safer shop in which to work than one that permits its housekeeping to become careless.

One outstanding example of the advantages to be gained by maintaining a clean place to work may be found in the sharp contrast between two steel plants in the same area. They are close enough together so that most conditions outside of the actual control of the plant, such as the availability of raw materials, markets, skilled labor, etc., are readily comparable. One company keeps its whole plant, buildings, grounds and machinery in good order. The other does not. The first plant has only about 45 per cent of the potential capacity of the second, yet its production is 60 per cent as high. On a basis of equal capacity its production is one-third more. Yet the type of material produced is the same and the quality is as good or better. It cannot be assumed that good housekeeping makes the whole difference, but it is an important factor in the difference.

Good housekeeping is not expensive. Unskilled labor is still readily available in spite of the acute shortage of skilled workers. A few extra janitors and a little extra help in the stores department and internal transportation systems can work wonders in keeping a shop clean and orderly, not only in keeping floors free of trash but in moving materials to and from machines in a steady stream, influencing the quantity and quality of production out of all proportions to their cost.

High Spots in

Railway Affairs . . .

Air Traffic in 1941

According to the Civil Aeronautics Administration of the Department of Commerce, domestic air lines in 1941 carried 3,768,892 revenue passengers, an increase of 38.16 per cent over the previous year. The average passenger air trip was somewhat shorter, since the revenue passenger-miles flown were up only 31.54 per cent. During 1941 19,209,671 lb. of express were carried, an increase of 53.6 per cent above 1940.

Steel Priority for Pipe Line Refused

Petroleum Co-ordinator Ickes is determined, if at all possible, to build a 24-inch crude oil pipe line from the East Texas fields to the refining area on the east coast. Although he has twice been turned down for priorities for steel pipe for such a line, he again took the matter up with the War Production Board. It turned thumbs down on the proposition, because it decided that "the value of the pipe line as a defense project was not great enough to justify the high priority ratings that would be necessary."

Ton-Miles Per Minute

The Bureau of Railway Economics, Association of American Railroads, points out that in 1941 the railroads of the United States moved an average of 904,000 tons of revenue freight one mile every minute in the year. In the month of October, when traffic was at its height, 1,069,000 tons were moved a mile every minute. It is said that this is the heaviest volume of freight traffic ever handled by the railroads in any year, exceeding the previous record established in 1929 by 6.2 per cent. "If materials for construction of new freight cars and locomotives and for maintenance purposes can be obtained," states the Bureau, "the railroads are confident of their ability to meet military and civilian transportation demands."

Pullman Rate Increase

The Interstate Commerce Commission on March 13 granted in full the application of the Pullman Company for authority to make a 10 per cent increase in sleeping and parlor car fares and charges. The decision includes a rule for the disposition of fractions, which will permit adding of amounts necessary to make all fares end in multiples of five cents. Commissioner Mahaffie criticized the free transportation policies of the railroads, but Commissioner Patterson felt that the officers and employees were fully entitled to such consideration.

Government Travel Expenses

Some of the newspaper columnists have been critical of the large amount of travel allowances made to the members of Congress. Now we find Senator McKellar, Democrat, of Tennessee, criticizing the executive departments of the government for their "utterly astonishing" travel expenditures. These, he pointed out, totaled $147,896,385 last year. He criticized the government employees for "using up the space on our trains, using cars and tires, getting a per diem, while they are traveling de luxe all over the country." He also stated that the Civilian Conservation Corps had spent $11,770,000 for travel.

Cunningham Heads The Research Study

The Transportation Board of Investigation and Research has planned for a series of studies of the relative economy and fitness of the various modes of transportation. William J. Cunningham, the James J. Hill Professor of Transportation at the Harvard Graduate School of Business Administration, has been appointed director of these studies. He is widely and favorably known among railroad men because of his leadership in the Department of Transportation at Harvard since 1916, and also for his service with a number of railroads, dating back to 1892. He was also assistant director of operation for the United States Railroad Administration during 1918-19.

Freight Rates Increased

The Interstate Commerce Commission on March 2 authorized an increase in freight rates and charges which, it is anticipated, will yield $203,000,000, or considerably less than the railroads had requested. It will be recalled that this increase is intended to offset the wage increases which were granted to the employees last fall. In its report the Commission did say that, "We have long felt the imposition of land grant deductions was unfair and that the main objective of the original grants long ago had been met so thoroughly that now it is equitable that the government should pay the same reasonable rates for its transportation that its citizens do." That question, however, is still under consideration by Congress. The new tariffs became effective on March 18, the I. C. C. denying a petition of the Office of Price Administration for their suspension until April 15. The Office of Defense Transportation also desires some modifications in the freight rate increases. Director Joseph B. Eastman on March 17 stated that "The function of the Division of Rates of the O. D. T. is to see that rates are established via the various carriers which will expedite the free flow of commodities necessary to the war effort. Because war conditions have caused dislocations in normal traffic movements it is and will continue to be necessary to negotiate certain rates for particular movements."

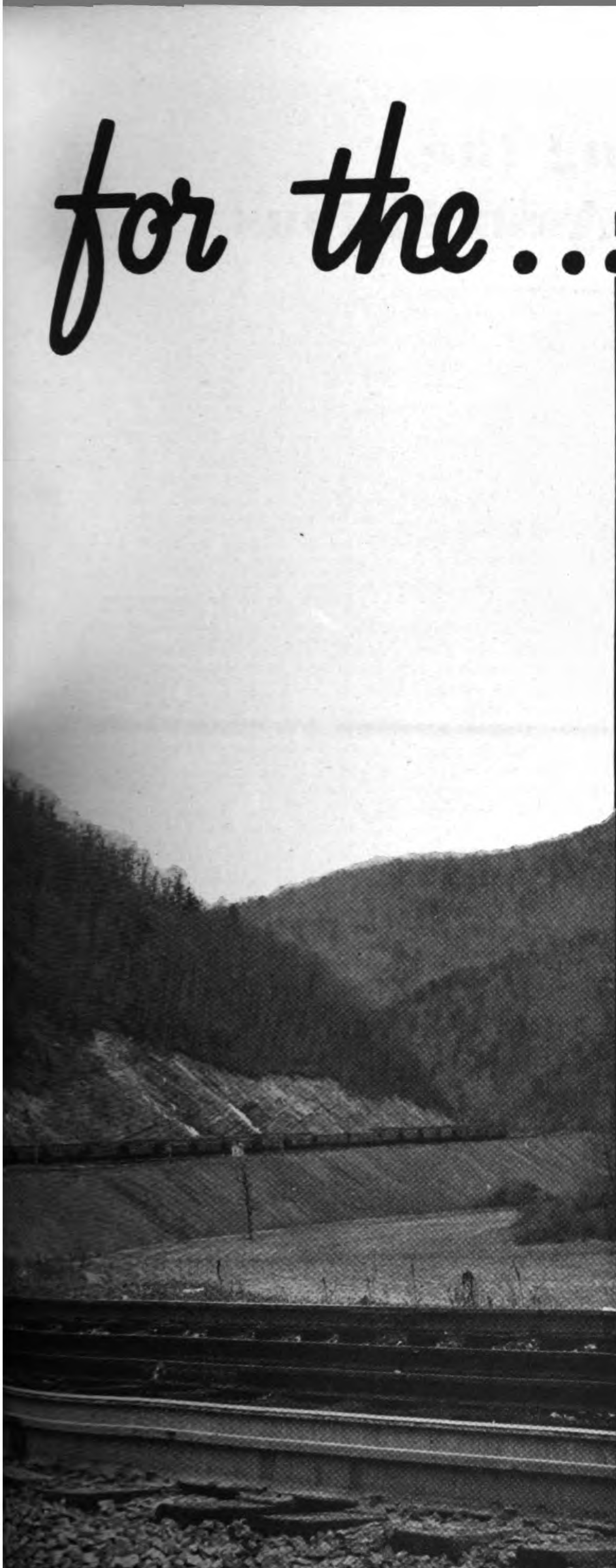
Mid-Week Vacation Starts Recommended

With increased business activity and with the large number of men in the military services, the passenger facilities promise to be stretched to the very limit during the coming months. The rubber tire shortage also promises to transfer travel from the highways to the railways. Ralph Budd, president of the Chicago, Burlington & Quincy, has suggested that the overcrowding can be somewhat relieved if, instead of starting vacations on the week-end during the summer months, the vacationists will plan to do their traveling on Monday, Tuesday, Wednesday and Thursday. He also suggested that special consideration be given to late spring and early fall vacations.

Tank Cars Rolling

Petroleum Co-ordinator Ickes reported that "the tank car movement of petroleum and petroleum products to the Atlantic seaboard mounted to a new high during the week ended March 7, reaching the unprecedented total of 435,086 barrels daily." Considering the strong and critical position that he took when it was first proposed to make a larger use of tank cars to relieve the shortage of these products on the east coast, it is interesting to have him say now that this speeding up of the tank car service is perhaps "the most spectacular" of the steps that have been taken to correct the situation which became acute last summer. In June the average miles per tank car per day was 37, reaching a high of 49.1 miles in October. This speaks well for the fine work done by the Car Service Division, which has worked intimately with the Office of Petroleum Co-ordinator, the Office of Defense Transportation and the oil companies.

(*Turn to second left-hand page*)



for the . . . .

AND

One of the ten 2-6-6-6 type articulated mallets, which have been christened the "Allegheny Type," and which were recently delivered by Lima to the Chesapeake & Ohio Railway. This marks the inauguration of a fleet of locomotives entirely new in design. The ordering of this radically different type of Super Steam Power by the C&O is indicative of the steps being taken by railroads all over the country in ordering Modern Power that is designed to meet today's demands for heavier loads hauled at higher speeds. » » This new fleet of "Allegheny Type" locomotives is being used by the Chesapeake & Ohio to speed up freight transportation by increasing train loads and reducing the running time over the steep grades of the Allegheny Mountains, without the use of helper engines. In addition to the original order for ten locomotives, the Chesapeake & Ohio has placed an additional order with Lima for ten more "Allegheny Type" locomotives that will be exact duplicates of those recently delivered.

LIMA
LOCOMOTIVE WORKS
INCORPORATED

INCORPORATED, LIMA, OHIO

Among the Clubs and Associations

NORTHWEST LOCOMOTIVE ASSOCIATION.—Meeting held March 16. Speaker: R. M. Cincoski, boiler foreman, Northern Pacific. Subject: Locomotive Boilers.

NORTHWEST CAR MEN'S ASSOCIATION.—Meeting April 6 at 8 p. m. at the Midway Club, St. Paul, Minn. Speaker: B. W. Locke. Subject: Manufacture and Use of Waste.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Meeting April 13 at 8 p. m. at the La Salle Hotel, Chicago. Dinner at 7 p. m. Speaker: Goodrich Q. Lewis, chief engineer, W. H. Miner. Subject: Draft Gear Maintenance.

CANADIAN RAILWAY CLUB. — Meeting April 13 at 8:15 at the Windsor Hotel, Montreal. Speaker: R. A. Carr, vice-president, Dearborn Chemical Company. Subject: The Behavior of Water in a Locomotive Boiler. Illustrations.

PACIFIC RAILWAY CLUB.—Meeting April 9 at 7:30 p. m. at the Transportation Club, Los Angeles, Calif. Speaker: R. M. Ostermann, vice-president, Superheater Company. Subject: "Has Steam Still a Future in Rail Transport?"

RAILWAY FUEL & TRAVELING ENGINEERS ASSOCIATION.—At a combined Executive and Advisory Committee meeting of the Railway Fuel & Traveling Engineers' Association at the Hotel Sherman, Chicago, on March 9, W. R. Sugg, superintendent of fuel conservation and lubrication, of the Missouri Pacific, with headquarters at St. Louis, Mo., was appointed vice-president in place of J. A. Burke, supervisor of air brakes, Atchison, Topeka & Santa Fe, who passed away early in February. Mr. Sugg was replaced on the Executive committee by G. B. Curtis, road foreman of engines, Richmond, Fredericksburg & Potomac, Richmond, Va.

RAILWAY SUPPLY MANUFACTURER'S ASSOCIATION.—Norman C. Naylor, vice-president of the American Locomotive Company, Chicago, and vice-president of the Railway Supply Manufacturer's Association, has been elected president of that association, succeeding Daniel L. Eubank, deceased. C. W. Floyd Coffin, vice-president of the Franklin Railway Supply Company, New York, chairman of the Exhibit committee and a member of the Executive committee of the association, has been elected vice-president, relieving Mr. Naylor, and R. P. Townsend, sales manager of the transportation department, Eastern region, Johns-Manville Sales Corporation, has been elected a member of the Executive committee, replacing Mr. Coffin. John D. Conway continues as secretary-treasurer.

NEW ENGLAND RAILROAD CLUB.—Meeting at the Hotel Touraine, Boston, Mass., on April 14 at 6:30 p. m. Speaker: F. W. Collins, industrial commissioner, Canadian Pacific. Subject: The Contribution of a Railway in the Building of a Nation.

A. A. R. Mechanical Division Annual Meeting Deferred

IN VIEW of present conditions it has been decided that there will be no annual meeting of the A. A. R. Mechanical Division for the year 1942. The various committees of the division are active in handling matters requiring attention, particularly those matters relating to the war effort. As fast as recommendations are proposed by the various committees they will be placed before the General committee and required action taken. Where necessary, they will be referred to the members by letter ballot.

As recommendations from the committees are approved, appropriate circulars or circular letters will be issued to the members. It is urged that any members having matters which require association attention should refer them to the secretary.

Sorenson Becomes Assistant to C. H. Buford

AUGUST L. SORENSON, manager of stores of the Erie, with headquarters at Hornell, N. Y., has been appointed assistant to the vice-president, operations and maintenance department of the Association of American Railroads, with headquarters at Washington, D. C.

DIRECTORY

The following list gives names of secretaries, dates of next regular meetings, and places of meetings of mechanical associations and railroad clubs:

ALLIED RAILWAY SUPPLY ASSOCIATION.—J. F. Gettrust, P. O. Box 5522, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—C. E. Davies, 29 West Thirty-ninth street, New York. Annual meeting Hotel Astor, New York, December 1-5.

RAILROAD DIVISION.—E. L. Woodward, *Railway Mechanical Engineer,* 105 West Adams street, Chicago.

ANTHRACITE VALLEY CAR FOREMEN'S ASSN.—Frank Kramer, 412 Hill street, Duryea, Pa. Meets third Monday of each month at Wilkes-Barre, Pa.

ASSOCIATION OF AMERICAN RAILROADS.—Charles H. Buford, vice-president Operations and Maintenance Department, Transportation Building, Washington, D. C.

OPERATING SECTION.—J. C. Caviston, 30 Vesey street, New York.

MECHANICAL DIVISION.—A. C. Browning, 59 East Van Buren street, Chicago.

PURCHASES AND STORES DIVISION.—W. J. Farrell, 30 Vesey street, New York.

MOTOR TRANSPORT DIVISION.—George M. Campbell, Transportation Building, Washington, D. C.

CANADIAN RAILWAY CLUB.—C. R. Crook, 4415 Marcil avenue, N. D. G., Montreal, Que. Regular meetings, second Monday of each month, except June, July and August, at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT ASSOCIATION OF ST. LOUIS.—J. J. Sheehan, 1101 Missouri Pacific Bldg., St. Louis, Mo. Regular monthly meetings third Tuesday of each month, except June, July and August, DeSoto Hotel, St. Louis.

CAR DEPARTMENT OFFICERS' ASSOCIATION.—Frank Kartheiser, chief clerk, Mechanical Dept. C. B. & Q., Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 8238 S. Campbell avenue, Chicago. Regular meetings, second Monday in each month, except June, July and August, La Salle Hotel, Chicago.

CAR FOREMEN'S ASSOCIATION OF OMAHA, COUNCIL BLUFFS AND SOUTH OMAHA INTERCHANGE.—H. E. Moran, Chicago Great Western, Council Bluffs, Ia. Regular meetings, second Thursday of each month.

CENTRAL RAILWAY CLUB OF BUFFALO.—Mrs. M. D. Reed, Room 1840-2, Hotel Statler, Buffalo, N. Y. Regular meetings, second Thursday of each month, except June, July and August, at Hotel Statler, Buffalo.

EASTERN CAR FOREMAN'S ASSOCIATION.—W. P. Dizard, 30 Church street, New York. Regular meetings, second Friday of January, February (annual dinner), March, April, May, October, and November at Engineering Societies Bldg., 29 West Thirty-ninth street, New York.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—H. T. Bramblet, care of H. P. Ruck, car foreman, Pennsylvania, 764 South Emerson avenue, Indianapolis, Ind. Regular meetings, first Monday of each month, except July, August and September, in Indianapolis Union Station, Indianapolis, at 7 p. m.

LOCOMOTIVE MAINTENANCE OFFICERS' ASSOCIATION.—Secretary-treasurer C. M. Lipscomb, Missouri Pacific, North Little Rock, Ark.

MASTER BOILER MAKERS' ASSOCIATION.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

MIDWEST AIR BRAKE CLUB.—C. F. Davidson, secretary-treasurer, general inspector car department, St. L.-S. F., Springfield, Mo.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meetings second Tuesday in each month, except June, July, August and September.

NEW YORK RAILROAD CLUB.—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Thursday in each month, except June, July, August, September and December at 29 West Thirty-ninth street, New York.

NORTHWEST CAR MEN'S ASSOCIATION.—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meetings first Monday each month, except June, July and August, at Midway Club rooms, 1931 University avenue, St. Paul.

NORTHWEST LOCOMOTIVE ASSOCIATION.—G. T. Gardell, 820 Northern Pacific Building, St. Paul, Minn. Meetings third Monday of each month, except June, July and August.

PACIFIC RAILWAY CLUB.—William S. Wollner, P. O. Box A, Sausalito, Calif. Monthly meetings alternately in northern and southern California.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1647 Oliver Building, Pittsburgh, Pa. Regular meetings, fourth Thursday in month except June, July and August, Fort Pitt Hotel, Pittsburgh, Pa.

RAILWAY FUEL AND TRAVELING ENGINEER' ASSOCIATION.—T. Duff Smith, Room 811, Utilities Building, 327 South La Salle street, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1941 Oliver Building, Pittsburgh, Pa.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings, third Thursday in January, March, May, July and September. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

TORONTO RAILWAY CLUB.—D. M. George, Box 8, Terminal A, Toronto, Ont. Meetings, fourth Monday of each month, except June, July, and August at Royal York Hotel, Toronto.

WESTERN RAILWAY CLUB.—E. E. Thulin, executive secretary, Room 822, 310 South Michigan avenue, Chicago. Regular meetings, third Monday in each month, except June, July, August, September, and January.

NEWS

Young Promoted to Brigadier General

Charles D. Young has recently been called to active duty with the Army and on March 16 was promoted from the rank of Colonel to that of Brigadier General. Brigadier General Young, a vice-president of the Pennsylvania, was serving as director of the Office of Defense Transportation's Section of Materials and Equipment, when he was called to active duty.

Steel Only for Cars of Designs Recommended by A. A. R.

Allocation of freight-car steel will hereafter be recommended by the War Production Board's Transportation Equipment Branch only for the construction of cars conforming to the designs and specifications set forth in last fall's report on the Car Construction Committee of the Mechanical Division, Association of American Railroads. That report, recommending that during the emergency orders for new freight cars conform to 13 designs, was reviewed in the December, 1941, issue of the *Railway Mechanical Engineer,* page 512.

The policy is applicable "to all orders placed after the first of this year and also to such prior orders scheduled for delivery so late this year that material utilized in construction shall not already have been processed or received." On orders received prior to the first of this year for cars scheduled for delivery after April 30, Mr. Stevenson suggests that the builders "file promptly with the Branch a statement itemizing the material to be utilized in their construction which has already been processed or received."

Knowlson Outlines Plan for Change from Priorities to Allocations

Announcing "a fundamental change in the priorities system," J. S. Knowlson, director of the Division of Industry Operations, War Production Board, has revealed that between April 1 and June 30 most of the blanket preference rating orders will be revoked or allowed to expire, and companies operating under such orders will be required to apply for priority assistance in accordance with the Production Requirements Plan under which materials are allocated quarterly by quotas.

The WPB announcement stated that the "rapidly increasing materials requirements of the war program make it impractical to continue the use of preference ratings which have been assigned under existing 'P' orders to whole industries, without any exact check of the amount of material which such ratings may be used to obtain." It added that "through the Production Requirements Plan, the director of industry operations will continue to assign ratings, but the rating assigned in each case may be used to obtain only a specified quantity of materials or products."

Freight-car and locomotive builders operating under orders P-8 and P-20 have already been directed to arrange to obtain materials under the Production Requirements Plan, although P-8 and P-20 have been extended until April 30. Meanwhile, such materials as steel plates, copper and aluminum have been on an allocation basis. The new plan contemplates new limitation and conservation orders to curtail "less essential" production and "to force substitutions for scarce materials wherever possible in essential industries."

O. C. Castle Appointed to ODT

O. C. Castle, former superintendent of transportation of the Southern Pacific Lines in Texas and Louisiana, who retired on March 15, has been appointed assistant director of the Division of Railway Transport, Office of Defense Transportation, with headquarters in Washington, D. C.

Priority Specialists for WPB Industry Branches

Priority specialists have been assigned to each of the War Production Board's industry branches to assist the branch chiefs "in the preparation of priority orders and assignment of priority ratings." Industry branches are found in WPB divisions of Materials, Production, and Industry Operations, the Transportation Branch being in the latter.

Professor Schmidt Dies

Edward C. Schmidt, who retired in 1940 as professor of railway engineering and head of the department of railway engineering at the University of Illinois, died on March 21 in a New York hospital after a week's illness. Mr. Schmidt was born in Jersey City, N. J., on May 14, 1874, and graduated from the Stevens Institute of Technology in 1895, then going with the Kalbfleisch Chemical Company of New York and Buffalo, N. Y. In 1896 he designed conveying machinery for the C. W. Hunt Company, New York, and in 1897 became assistant to the mechanical engineer, steam department of the Edison Electric Illuminating Company, Brooklyn, N. Y. The following year, he went with the American Stoker Company at New York and a short time later was appointed an instructor and assistant professor in experimental and railway mechanical engineering at the University of Illinois. In 1903 he became engineer of the American Hoist & Derrick Co., and in 1904 went with the Kerr Turbine Co., Wellsville, N. Y., as engineer of tests. Mr. Schmidt returned to the University of Illinois in 1906 as head of the department of railway engineering. During the first World War he served as a major in the army ordnance department on detached service with the United States Fuel Administration and the United States Railroad Administration and in 1919 became staff mechanical engineer of the North American Company. In 1921 he returned to the University of Illinois as professor of railway engineering and head of that department. Mr. Schmidt had been active in the American Society of Mechanical Engineers for many years and served as chairman of the executive committee, Fuels division, in 1925 and 1926; chairman of the committee on Locomotive Test Codes in 1927; and chairman of the executive committee, Railroad division, in 1937 and 1938. He has also been active in the American Railway Engineering Association and served as chairman of the committee on the Economics of Railway Location in 1922 and 1923.

Hollar Heads ODT Material Section

Philip A. Hollar, special representative of the Operations and Maintenance Department of the Association of American Railroads and former-assistant stores manager of the Pennsylvania, has been appointed acting director of the Office of Defense Transportation's Section of Materials and Equipment. He succeeds Colonel Charles D. Young who has been called to active duty with the Army.

Along with Mr. Hollar's appointment, Director Eastman also announced the appointments of Carroll W. Brown as assistant to the Director of the Materials and Equipment Section; and of eight consultants who will advise Mr. Hollar on technical matters pertaining to materials and equipment for various branches of the transportation industry. Mr. Brown served on the staff of the Federal Coordinator of Transportation as assistant director of the Section of Property and Equipment, and he has recently been employed as an equipment engineer on construction work at the Ravenna, Ohio, ordnance plant.

The eight consultants and the matters on which they will advise are as follows: F. H. Hardin, president of the Association of Manufacturers of Chilled Car Wheels—railroad freight, passenger, and all other types of cars; J. G. Bower, formerly Eastern representative of the Buckeye Steel Castings Company — castings and miscellaneous items required in rail transportation, manufacture and maintenance; Charles T. Ripley, chief engineer, Technical Board of the Wrought Steel Wheel Industry—steam, Diesel, and electric locomotives; H. L. Hamilton, manager of the Electro-Mo-

(*Continued on second left-hand page*)

33⅓% increase in

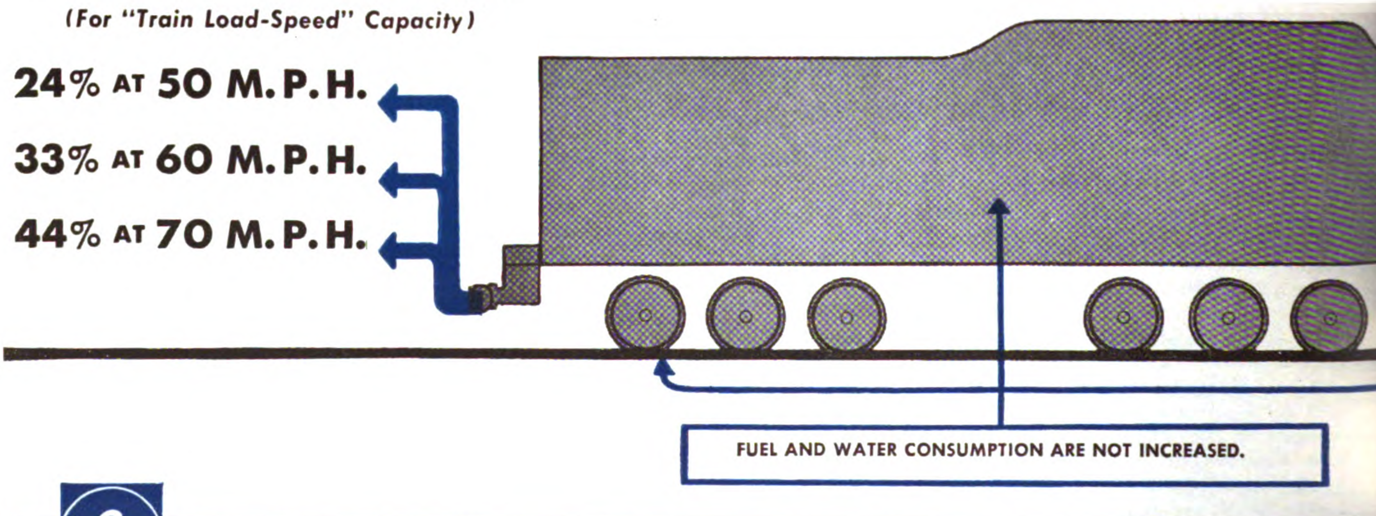
(WITHOUT INCREASING THE SIZE OF THE LOCOMOTIVE)

by application of . .

The steam locomotive is possessed of latent power which now can be released by The Franklin System of Steam Distribution. This system, which is applicable to existing as well as new steam locomotives, is the result of years of experimentation, research and road tests and is offered to the railroads as a means of increasing train speed and load capacity without increasing the size of the locomotive.

INCREASED DRAWBAR HORSEPOWER

(For "Train Load-Speed" Capacity)



REG. U.S. PAT. OFF.

FRANKLIN RAILWAY SUPPLY

In Canada: Franklin Railway

tive Division of the General Motors Corporation—Diesel engines for railroad propulsion equipment; Irving B. Babcock, president and general manager of the General Motors Truck Corporation—buses, trucks, taxicabs, and replacement parts; Harold C. Davis, vice-president of Consolidated Motor Lines, Inc.—equipment and supplies for maintenance of buses and trucks; Robert F. Black, president of the White Motor Company — equipment on which production has been suspended, including buses, trucks, fire-fighting apparatus, road work equipment, and work equipment for public utilities and communications companies; A. L. Viles, president of the Rubber Manufacturers Association, Inc., and chairman of the buying committee of the Rubber Reserve Company, affiliate of the Reconstruction Finance Corporation —rubber products, including tires, tubes, insulated wire, and belting and other mechanical rubber goods.

Copper for Railroad Maintenance

The use of copper for "essential operating parts and essential maintenance and repair parts" for railway locomotives, cars and equipment will be permitted under an amendment to Order M-9-c issued March 2 by the Director of Industry Operations. The amendment adds railroad uses to List "B" of the Order, which permits the use of copper where the use of less scarce material is impractical.

An official interpretation shortly will be issued by the Copper Branch, War Production Board, to guide railroads in the uses for which copper will be permitted.

Steel Plate Allocation Order

Order M-21-c which formalizes the allocation system on steel plates has been issued by J. S. Knowlson, director of industry operations, War Production Board.

The allocation system, announced on February 17, was outlined in the March *Railway Mechanical Engineer,* page 125. Under it plate allocations have been carried out under General Allocations Order No. 1, which now is changed to M-21-c to conform to the general system of numbering. The order changes the definition of plates to include stainless steel but otherwise follows the plate allocation and reporting system now in force.

Probable Traffic and Equipment Needs

Presidents and other executives of member roads of the Association of American Railroads met with J. J. Pelley, president of the A. A. R., at the Stevens Hotel, Chicago, on February 27, to consider the probable traffic requirements and the general equipment outlook for the railroads during the coming year. The discussion indicated that, with the co-operation of authorities at Washington in making materials available for the construction of cars and locomotives, the railroads expect to handle successfully all war traffic which may be offered. It is anticipated that 113,000 new freight cars will be delivered to the railroads by October 1, thereby increasing the total number of serviceable cars to 1,692,000, or more than enough to handle a peak fall movement of 1,000,000 car loads a week.

Conversion of Locomotive Plants

The War Production Board is considering a question raised by locomotive builders as to how much capacity they should hold in readiness to meet the requirements of the Office of Defense Transportation while they proceed with their plant-conversion programs. This was revealed by J. S. Knowlson, director of WPB's Division of Industry Operations, in his discussion of conversion at a February 24 press conference.

Citing the locomotive builders' problem as a typical problem of conversion, Mr. Knowlson said that they have an A-3 priority and they have to give preference to Army and Navy orders. He conceded, however, that locomotives, too, are essential to the war effort; and thus WPB is working on the industry's aforementioned query.

C. Vanderbilt, Engineer, Dies at 68

Brigadier General Cornelius Vanderbilt, a member of the famous railroad "dynasty" and a mechanical engineer who developed a new fire box and a special tender design, died on his yacht at Miami, Fla., on March 1, at the age of 68. Born the great-grandson of Cornelius Vanderbilt who built up the New York Central system and originated the family's great railroad holdings, General Vanderbilt early showed a great fondness for the railroad business and an aptitude for mechanical engineering. Receiving his B.A. degree at Yale University in 1895, he was apprenticed to the mechanical department of the New York Central and was engaged in many of the advanced designs of locomotives which the Central was then introducing. In 1897, he took up a scientific graduate course at Yale, receiving his Ph.B. in 1898 and M.E. in 1899. For a few months thereafter he worked in the civil engineering department of the road, being forced to give up direct railroad employment upon the death of his father.

In 1899 General Vanderbilt patented a boiler which embodied a corrugated, cylindrical firebox without stays. This design was first embodied in a New York Central "ten-wheeler" built at the West Albany shops. General Vanderbilt also designed a cylindrical locomotive tender, the first of which was attached to a freight locomotive built by Baldwin for the Illinois Central in 1900. He was long a director of a number of roads, including the New York Central, Delaware & Hudson and Illinois Central.

Illinois Central Starts Big Scrap Hunt

The Illinois Central has started a system-wide scrap hunt to round up critical materials for war use. Every mile of its lines in 14 states will be combed by scrap hunters, and all vital materials that are found which cannot be reused on the railroad will be added to shipments going into war production. The scrap hunt is being conducted by a committee of which William S. Morehead, general storekeeper, is chairman, and representatives of all material-using departments of the railroad are members.

The scrap hunters will go over the entire railroad, paying particular attention to shops, water stations, power plants, abandoned structures and obsolete machinery, seeking materials that can be put to use to win the war. All usable parts will be reclaimed and put in the critical categories, and all parts which cannot be reclaimed will be sorted out and made ready for the scrap market.

Rules for Steel Plate Consumers

Consumers of steel plates have been asked by the Iron and Steel Branch, War Production Board, to conform to a list of requirements in placing orders so that all plates possible may come from continuous strip mills. The requirements are:

Edges—Universal or strip mill edge should be acceptable for all plates that can be rolled within the limits of strip mills.

Widths—Plates should be 72 in. and narrower wherever practical on account of the larger number of units available in the industry. (6 strip mills can produce plates up to 72 in. wide, 1 up to 84 in. and 3 up to 90 in.).

Gauges—Gauges should be held to a minimum number. If possible, from $^3/_{16}$ in. to $^3/_4$ in. use only increments of $^1/_{32}$ in.; and from $^3/_4$ in. to $1\frac{1}{2}$ in. increments of $^1/_{16}$ in. Most strip mills can produce plates up to $^3/_4$ in. thick; some can produce thicker plates and some are confined to thinner gauges.

Lengths—To the fullest extent possible, lengths should be held to 30 ft. and under, on account of the number of mills whose maximum length is 30 ft. to 30 ft. 6 in. Multiples of short lengths desirable, but not to exceed 30 ft. 6 in.

Tonnage—A minimum of 10 tons per item for any width, gauge and length is required in order to obtain maximum strip mill production.

Marking—The marking requirements should be kept to a minimum that will properly identify the item.

Purchasing—Orders should be placed as far in advance as possible, giving full specifications and order of sequence. This should be not less than 30 days in advance of the first day of the month in which shipment is desired and preferably earlier.

Design—In designing new boats, particular attention should be given to the above requirements.

Stock—Any orders for stock material should be kept to a minimum number of widths and lengths.

Higher Preference Ratings for Repair and Maintenance Materials

Higher preference ratings for railroad maintenance materials and operating supplies and improved procedures in connection therewith have been provided by the War Production Board in Preference Rating Order No. P-88, issued March 17 by J. S. Knowlson, director of WPB's Division of Industry Operations. In addition to providing an A-1-a rating for delivery of materials needed for emergency repairs upon specific approval of WPB, the order in general assigns an A-3 rating to the more important maintenance and operating materials, and an A-8 to other repair parts and supplies. Under the previous set-up, all of the foregoing have had only an A-10 rating under Order P-100 which covers maintenance and operating materials for various industries.

To get the new A-1-a rating assigned to

materials needed for emergency repairs a railroad must communicate with WPB describing the material essential for emergency repair and the nature of the emergency necessitating such repair. The director of industry operations "will notify such railroad whether, and to what extent, its application is approved, and a copy of such notification shall be furnished by the railroad to its supplier to evidence the A-1-a rating."

In addition to embracing the already A-3 rated materials for freight-car and locomotive repairs, the new plan raises from A-10 to A-3 the rating on materials to be used for maintenance or repair of passenger cars, rail, track fastenings, turnouts, crossings, bridges, float bridges, turntables, signals, interlockings, centralized traffic control systems, coal and ore handling and conveying machinery, freight handling and warehousing equipment, floating equipment, wreck equipment, maintenance of way work equipment, telephone and telegraph systems, water and fueling plants, car retarders, sales, power plants, transmission systems, and shop tools and equipment; also, operating supplies necessary in the actual operation of trains, cars, or locomotives, and deliveries to the railroads of perishable tools which are consumed in the maintenance or repair of any of the above items of equipment. Raised from A-10 to A-8 are the ratings on deliveries to railroads "of other material necessary for maintenance, repair or operating supplies."

Each rating assigned to the railroad is extensible to suppliers of raw materials going into the maintenance parts involved. The order, however, sets up restrictions on both railroads and suppliers, designed to preclude the accumulation of inventories above "a practicable working minimum." Also, the order stipulates that every railroad and supplier "shall wherever possible use conservation measures such as substitution, redesign and respecification to eliminate scarce materials normally used." In that connection the director of industry operations "may from time to time require the elimination or diminution of the use of any material, with or without substitution of other materials, and may specify the use in the operation, maintenance and repair of railroads to which specific types of material can be put."

Equipment Purchasing and Modernization

Atchison, Topeka & Santa Fe.—On February 24, the directors of the Atchison, Topeka & Santa Fe approved the purchase of 10 5,400-hp. Diesel-Electric freight engines, 20 steam locomotives of the 4-8-4 type and 100 60-ft. flat cars, costing approximately $10,000,000. All of the equipment will be ordered for delivery in 1943. The Electro-Motive Corporation will build the Diesel-electric locomotives, the Baldwin Locomotive works the steam locomotives and the order for the flat cars will be awarded later.

Chicago & Eastern Illinois.—The Chicago & Eastern Illinois has been authorized by Division 4 of the Interstate Commerce Commission to assume liability for $1,200,000 of 2½ per cent equipment trust certificates, application for which was noted on page 124 of the March issue.

Chicago & Northwestern.—The Chicago & Northwestern has been authorized by Division 4 of the Interstate Commerce Commission to assume liability for the $3,750,000 of 2½ per cent equipment trust certificates, application for which was mentioned on page 125 of the March issue.

Chicago, Indianapolis & Louisville.—The 1942 budget for additions and betterments on the Chicago, Indianapolis & Louisville, calling for expenditures of $3,321,000 for road and equipment as compared to $3,859,000 in 1941, has been approved by Judge Michael L. Igoe of the Federal district court, Chicago. Of the total for 1942, $2,740,000 has been allocated for new equipment, including cars already on order; $141,000 for repairs to old equipment, and $440,000 for roadbed.

(Continued on second left-hand page)

Orders and Inquiries for New Equipment Placed Since the Closing of the March Issue

LOCOMOTIVE ORDERS

Road	No. of Locos.	Type of Locos.	Builder
Atchison, Topeka & Santa Fe	10	5,400-hp. Diesel-elec.	Electro-Motive Corp.
	20	4-8-4	Baldwin Loco. Wks.
Boston & Maine	3	1,000-hp. Diesel-elec.	Electro-Motive Corp.
Delaware & Hudson[1]	15	4-8-4	American Loco. Co.
Denver & Rio Grande Western	10[2]	4-6-6-4	Baldwin Loco. Wks.
	6[2]	5,400-hp. Diesel-elec.	Electro-Motive Corp.
Lehigh Valley	5	1,000-hp. Diesel-elec.	Electro-Motive Corp.
	5	1,000-hp. Diesel-elec.	American Loco. Co.
New York, Chicago & St. Louis	10	2-8-4	Lima Loco. Wks.
Northern Pacific	10[3]	4-8-4 frt. and pass.	Baldwin Loco. Wks.
	12[3]	4-6-6-4	American Loco. Co.
	3[3]	5,400-hp. Diesel-elec.	Electro-Motive Corp.
Richmond, Fredericksburg & Potomac	10	2-8-4	Lima Loco. Wks.
St. Louis Southwestern	5	4-8-4	Company shops
Southern Pacific	30	4-8-8-2	Baldwin Loco. Wks.
	10	4-8-4	Lima Loco. Wks.
	30	1,000-hp. Diesel-elec.	American Loco. Co.
Union Pacific	30	4-6-6-4	American Loco. Co.

LOCOMOTIVE INQUIRIES

Duluth, Missabe & Northern	10	2-8-8-4	....
Indianapolis Union	1 or 2	0-8-0	....

FREIGHT-CAR ORDERS

Road	No. of Cars	Type of Cars	Builder
American Steel & Wire Co.	65	70-ton gondola	Magor Car Corp.
Atlantic Refining Co.	8	40-ton tank	Gregg Co., Ltd.
Central of Georgia	50	50-ton hopper	Pull.-Std. Car Mfg. Co.
Chicago, Milwaukee, St. Paul & Pacific	35	70-ton hopper	Company shops
	35	70-ton gondola	
Chicago, Rock Island & Pacific	350	50-ton auto-box	Pressed Steel Car Co.
	300	50-ton flat	Company shops
	25	70-ton covered hopper	Gen. Amer. Trans. Co.
	200	40-ton auto-box	Pressed Steel Car Co.
Lehigh Valley	500	50-ton hopper	Bethlehem Steel Co.
Linde Air Products Co.	39	70-ton box	Gen. Amer. Transp. Corp.
Nashville, Chattanooga & St. Louis	250	50-ton hopper	Pull.-Std. Car Mfg. Co.
	25	50-ton box	
	50	50-ton gondola	Bethlehem Steel Co.
	75	70-ton gondola	Greenville Steel Car Co.
National Rys. of Mexico	500	50-ton box	
	200	50-ton gondola	Magor Car Corp.
	70	Air-dump	
	200	50-ton tank	American Car & Fdry. Co.
National Tube Co.	98	70-ton gondola	Magor Car Corp.
New York, Chicago & St. Louis	50	70-ton hopper	American Car & Fdry. Co.
	50	50-ton flat	Pull.-Std. Car Mfg. Co.
Richmond, Fredericksburg & Potomac	20	50-ton box	Pull.-Std. Car & Mfg. Co.
Rubber Reserve Co.	50	50-ton tank	American Car & Fdry. Co.
Union Pacific	1,000	50-ton ballast	American Car & Fdry. Co.
	1,000	50-ton gondola	Pull.-Std. Car Mfg. Co.

FREIGHT-CAR INQUIRIES

Atchison, Topeka & Santa Fe	100	Flat	....
Baldwin Loco. Works	15	50-ton gondola	....
	6	50-ton flat	....
	5	Hopper	....
Bessemer & Lake Erie	800	90-ton hopper	....
Canadian National	4,000	50-ton box	....
	250	70-ton hopper	....
Canadian Pacific	550	50-ton box	....
	200	40-ton box	....
	150	75-ton ore	....
Chicago, Indianapolis & Louisville	200	50-ton box	....
	200	50-ton hopper	....
	100	70-ton flat	....
Denver & Rio Grande Western	1,000	70-ton drop-door gondola	....
	450	50-ton flat-bottom gondola	....
	50	70-ton mill-type gondola	....
Duluth, Missabe & Iron Range	2,000	75-ton ore	....
Texas & Pacific	500	50-ton box	....

PASSENGER-CAR ORDERS

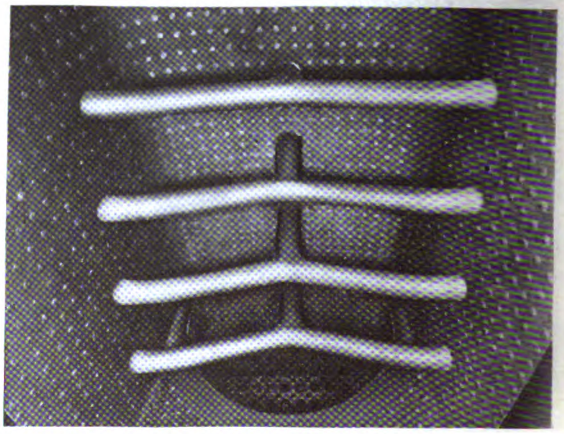
Road	No. of Cars	Type of Car	Builder
National Rys. of Mexico	20	Bagg.-exp.	Magor Car Corp.

[1] Delivery expected to begin March, 1943.
[2] Order subject to approval by the court.
[3] The 25 locomotives will cost approximately $6,500,000.
[4] Orders for the 40 steam locomotives and 30 Diesel-electric switching engines to cost approximately $12,000,000. Deliveries are expected to start in October of this year. The 4-8-8-2 locomotives will be adaptable to heavy freight or passenger service. The 4-8-4's will be of the streamline "Daylight" type for passenger and fast-freight service. The 40 Diesel-electric locomotives will be for general use in the road's principal terminals.

18 Million Miles

OF SUCCESSFUL OPERATION HAVE PROVED THE SECURITY CIRCULATOR

Security Circulators, operating on 24 railroads, have accumulated over 18 million locomotive miles, mostly in heavy, fast freight and passenger service. » » Some of these Circulator-equipped locomotives have operated over 400,000 miles. » » The Security Circulators in service have proved so successful that repeat orders are constantly being placed.



View illustrating the positioning of Security Circulators in an average size of locomotive firebox prior to installing the brick arch.

AMERICAN ARCH

Security Circulator Division

Chicago, Milwaukee, St. Paul & Pacific.—The Milwaukee has been authorized by the district court to spend $10,529,238 for improvements in 1942. Of the total, $6,846,000 is for repairs to roadbed and equipment.

Great Northern.—Maintenance of its present plant and acquisition of new equipment will cost the Great Northern railway more than 26½ million dollars in 1942, according to the proposed maintenance, improvement and equipment program, which is contingent on the continued availability to the company of necessary materials through government priorities. By December 31, 1942, the company hopes to have in service approximately 43,400 freight cars of all types.

Equipment now on order includes 9 Diesel locomotives, which will cost approximately $2,000,000, and 1,000 50-ton box cars, construction of which will cost $3,000,000. Delivery of 2,000 50-ton box cars, ordered in 1941, has begun and is scheduled for completion by July 1. These cars will be augmented by the 1,000 box cars on this year's program. The latter equipment now is under construction in the company's shops in St. Cloud, Minn. Of the Diesel locomotives "on order," 3 will be 5,400 hp. for freight service on the Kalispell division in Montana, much of which is through the Rocky Mountains. All of the remaining 6 Diesels on order will be 1,000 hp.

Illinois Central.—The directors of the Illinois Central have approved a large locomotive and car buying program, the details of which will be announced shortly.

The Lehigh & New England is reported to be considering the purchase of new freight cars.

Pacific Fruit Express. — The Pacific Fruit Express will spend more than $21,000,000 for the purchase of new cars and the rebuilding and heavy repairs to existing equipment in 1942. The new cars, orders for which will be placed shortly, include 2,000 refrigerator cars. The rebuilding program involves 2,500 refrigerator cars which will be equipped with new bodies in company shops in 1942 and 1943. During the same period, 3,000 refrigerator cars will be given heavy repairs.

Southern Pacific. — The Southern Pacific has asked the Interstate Commerce Commission for authority to assume liability for $5,660,000 of 2½ per cent equipment trust certificates, maturing in 10 equal annual installments of $566,000 on April 1 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $7,111,401 and consisting of 1,900 steel-sheathed, wood-lined box cars and 300 steel flat cars with wood flooring.

Tennessee Central.—This company has asked the Interstate Commerce Commission for authority to assume liability for $342,000 of 2¾ per cent equipment trust certificates, maturing in 20 semiannual installments of $18,000 on January 1 and July 1, 1943, and $17,000 on January 1 and July 1, in each year thereafter to and including July 1, 1952. The proceeds will be used as a part of the purchase price of new equipment costing a total of $380,000 and consisting of 100 all-steel hopper cars and two 660-hp. Diesel-electric switching locomotives.

Supply Trade Notes

THE DEVILBISS COMPANY has moved its St. Louis, Mo., sales and service branch to 2737 Washington avenue.

◆

THE BURGESS BATTERY COMPANY has announced a change of address of its acoustic division to 2815 West Roscoe street, Chicago.

◆

SYMINGTON-GOULD CORPORATION. — The following changes have been made in titles in the engineering department of the Symington-Gould Corporation: At Rochester, N. Y.—*C. I. Lusink*, chief mechanical engineer; *C. P. Noser*, assistant to chief mechanical engineer; *E. R. Oeschger*, mechanical engineer, and *E. J. Warnock*, chief draftsman. At Depew, N. Y.—*R. E. Blakely*, resident engineer; *C. I. Smith*, chief draftsman, and *W. C. Weaver*, assistant works engineer. Mr. Lusink was formerly mechanical engineer.

◆

CAMEL SALES COMPANY.—*Leo F. Duffy*, assistant vice-president of the Camel Sales Company, Chicago, has been appointed vice-president; *Leo C. Voss*, assistant treasurer, has been promoted to the position of assistant vice-president; and *Earl C. Browne* has been appointed assistant vice-president.

◆

PITTSBURGH PLATE GLASS COMPANY.—*R. B. Tucker*, director of the glass sales of the Pittsburgh Plate Glass Company, has been elected to the board of directors, succeeding *H. A. Galt*, who is retiring after more than 40 years of continuous service.

◆

D. J. WILLIAMS, western railroad sales manager of the Air Reduction Sales Company, with headquarters at San Francisco, Calif., has entered the services of the U. S. Navy as lieutenant commander, and will be located in the Ninth Naval District, working with the Office of Material Procurement.

◆

PAUL KELLER, manager of the Cleveland, Ohio, sales district of the Copperweld Steel Company, has been appointed manager of tool, stainless, and special steel sales, with headquarters at Warren, Ohio.

◆

UNITED STATES STEEL CORP.—*John J. Davis, Jr.*, assistant manager of sales at Chicago of the Railroad Materials and Commercial Forgings division of the United States Steel Corporation, will have charge of that division during the absence of *Orrin H. Baker*, manager of the division, who is serving with the War Production Board at Washington, D. C.

◆

PULLMAN-STANDARD CAR MANUFACTURING COMPANY.—*T. P. Gorter*, sales agent of the Pullman-Standard Car Manufacturing Company, with headquarters at Washington, and *J. W. Scallan*, manager of sales of the Western district, with headquarters at Chicago, have been appointed assistant vice-presidents with headquarters at Washington.

◆

THE GISHOLT MACHINE COMPANY, Madison, Wis., manufacturers of turret and automatic lathes and static and dynamic balancing machines, has expanded its facilities for the manufacture of turret lathes by approximately 50,000 sq. ft. by the addition of a new one-story building at its Northern Works.

◆

E. P. BULLARD, JR., president of the Bullard Company of Bridgeport, Conn., and inventor of the Bullard vertical turret lathe, the mult-au-matic and the contin-u-matic, on March 10 marked the 50th year of his active participation in the firm founded in 1880 by his father.

The company's output of machine tools is now entirely for defense, carrying out a tradition started when Mr. Bullard's father was recalled from the Northern army in the Civil War to make pistols at the Colt plant in Hartford, Conn., and continued when Mr. Bullard turned out machine tools and 155 mm guns for the allied powers in World War I. When Mr. Bullard was graduated from Amherst College and completed his apprenticeship under his father, the company had 55 employees. There are now 5,000 employees built around a large nucleus of men trained under an apprenticeship program maintained throughout the depression years. Eighteen associates, whose service totaled 786 years, greeted Mr. Bullard on his golden anniversary as an industrialist.

◆

EDGEWATER STEEL COMPANY.—*F. B. Bell*, who has been president of the Edgewater Steel Company since its organization 25 years ago, has been elected chairman of the board of directors. Mr. Bell has been devoting most of his time to his work in the War Production Board and asked that he be relieved of the detailed duties of president. *D. S. Bell* was chosen as president of the company and J. H. Baily, D. W. McGeorge, and W. F. Carey reappointed to the offices of vice-president, secretary and treasurer, respectively. *M. A. Smith* was elected to the new office of vice-president and general manager and *J. F. Manns* as assistant secretary. D. S. Bell and W. F. Carey were also elected directors of the company.

(*Continued on next left-hand page*)

MODERN *Steam* LOCOMOTIVES...

play an important part in helping to keep "bottlenecks" open.

A modern steam locomotive is a well balanced machine, with a boiler that develops maximum horsepower with the minimum of fuel . . . and backs up cylinder horsepower 100%.

This factor of high and sustained power can be developed in existing steam locomotives by increasing the superheat, and reclaiming waste heat with Elesco equipment.

Are you giving it the consideration it deserves?

A-1489

Edwards Company.—*Ralph B. Rogers*, president of the Edwards Company, manufacturers of self-propelled railway passenger motor cars, will head, as president, the new management of the Hill Diesel

Ralph B. Rogers

Engine Company, which has been purchased by the Edwards Company. *R. E. Olds* will remain as chairman of the board of directors. Due to the demands for increased production created by the war, an extensive program of modernization and enlargement of manufacturing facilities of the Hill Company has been started.

◆

Pullman Company.—*G. M. Williams*, assistant mechanical superintendent of the Pullman Company, with headquarters at Chicago, has retired, and *E. L. Goodwin*, assistant to the mechanical superintendent at Chicago, and *John Cannon*, manager of the Wilmington (Del.) shop, have been promoted to senior and junior assistant mechanical superintendents, respectively, with headquarters at Chicago, succeeding Mr. Williams.

Mr. Goodwin entered the service of the Pullman Company at its Denver (Colo.) repair shop in 1905 and was later transferred to Richmond, Calif. In December, 1919, he was appointed mechanical inspector at Chicago, and on January 1, 1923, became assistant to the mechanical superintendent.

Mr. Cannon entered the service of the Pullman Company on April 15, 1912, at its Wilmington shop and all of his service has been at that point. He was promoted successively through various positions, becoming manager on February 1, 1942.

◆

Ralph Kelly, vice-president in charge of sales for the Westinghouse Electric & Manufacturing Co. since 1938, has been elected executive vice-president and a director of the Baldwin Locomotive Works. Mr. Kelly graduated from Harvard University in 1909 and that year began his association with Westinghouse as an apprentice in its power engineering department. He served as a lieutenant in the United States Navy during the first world war and in 1920 rejoined Westinghouse in its marine engineering division, subsequently becoming the engineering manager of the company's southwestern district, with headquarters at St. Louis, Mo. He advanced to manager of that district and later to manager of the central district with headquarters at Pittsburgh, Pa. In 1934, Mr. Kelly was appointed vice-president in charge of the operating division of Westinghouse centered around east Pittsburgh, Pa., and in 1938 he became vice-president in charge of sales. Mr. Kelly is a director of the Canadian Westinghouse Company, Ltd., as well as of a number of Westinghouse affiliates, including Bryant Electric Company and Westinghouse Electric International Company. His membership includes the National Electrical Manufacturers Association, of which he is a vice-president and a member of the Board of Governors, and the American Iron & Steel Institute.

◆

The Independent Pneumatic Tool Company has moved its Detroit branch to its own new building at 15605 Woodrow Wilson avenue. Other new branch offices and service stations have recently been opened at Philadelphia and San Francisco. Additions have also been made to Thor factory facilities at Los Angeles, Calif., and Aurora, Ill.

◆

The Waugh Laboratories of New York, a division of the Waugh Equipment Company, has opened a Pacific coast branch with offices in the Petroleum building, 714 Olympic boulevard, Los Angeles, Calif. *Emmett M. Irwin* has been placed in charge. Mr. Irwin, a graduate of the California Institute of Technology, has been engaged for many years as a consulting engineer in Los Angeles. He acted in this capacity on the wind tunnel at Akron, Ohio; was consulting and construction engineer on the Diesel-electric power plant at Crescent City, Calif., and was as-

Emmett M. Irwin

sistant consulting engineer for the Imperial irrigation district in connection with the power project for the all American canal. He was also engineer in charge of design for the pump testing laboratory of the metropolitan water district of southern California, chief electrical engineer in charge of design and construction of all controls and drives for the 200-in. telescope being constructed at Palomar Mt., Calif., and chief engineer for the Magnatest Corporation of Long Beach, Calif., developing a magnetic testing system for use in connection with the fatigue of metals.

Scully Steel Products Co.—*E. E. Aldous* has been elected president and a director, *L. B. Worthington* vice-president and a director, and *Charles B. Vernooy* comptroller, secretary and a director of the *Scully Steel Products Company*, a subsidiary of the United States Steel Corporation. Mr. Aldous was previously manager of sales for United States Steel Corporation subsidiaries at Houston, Tex. Mr. Worthington had been manager of sales, bar, strip and semi-finished materials of the Carnegie-Illinois Steel Corporation at Pittsburgh, Pa. Mr. Vernooy had been staff assistant of the procedure section of the American Steel & Wire Co. at Cleveland, Ohio.

Mr. Aldous began his service with United States Steel Corporation subsidiaries in 1901 in the Denver, Colo., office

E. E. Aldous

of American Steel & Wire Co. He served in a sales capacity, at different times covering the entire inter-mountain territory. In 1921 he was transferred to St. Paul, Minn., as manager of sales of the St. Paul office, of the American Steel & Wire Co., and was transferred in 1929 to Chicago as manager of sales, fence and post department. Mr. Aldous was promoted to manager of sales for United States Steel Corporation subsidiaries at Houston, in 1933, which position he held until his recent promotion.

◆

American Car and Foundry Company.—*J. L. Mahon* has been appointed district manager and *Robert Clade* works manager of the valve division of the American Car and Foundry Company at Detroit, Mich. Mr. Mahon was formerly superintendent of foundries. *P. H. Sullivan*, formerly assistant district manager in Detroit, has been retired at his own request.

◆

Jones & Laughlin Steel Corp.—*C. M. Mason*, district sales manager in Buffalo, N. Y., for the Jones & Laughlin Steel Corporation, has been appointed district sales manager with headquarters at Cleveland, Ohio, succeeding *E. A. France*, who retired after 37 years of service with the company. *E. H. Hughes*, formerly district sales manager at St. Louis, Mo., will succeed Mr. Mason at Buffalo. *L. S. Berkey*, formerly resident manager of

sales in Toledo, Ohio, has been appointed district manager at St. Louis, and *E. S. Lewis,* of the company's general sales office in Pittsburgh, Pa., has been appointed resident manager at Toledo. *P. B. Turner,* special representative in the New York office, has been appointed manager of export sales, with *W. R. Spindler,* assistant manager.

◆

CATERPILLAR TRACTOR COMPANY.—*Harmon S. Eberhard* has been elected a vice-president of the Caterpillar Tractor Company, Peoria, Ill., succeeding *Thomas John O'Connor,* deceased. *C. G. A. Rosen* has been appointed director of a newly created research department. *G. E. Burks* has been promoted to the position of chief engineer.

Mr. Eberhard was born at Stockton, Calif., and entered the employ of the Holt Manufacturing Company there at the age of sixteen, serving as a draftsman in the engineering department. He enlisted as a private in the Corps of Engineers in World War I and was discharged with the rank of sergeant after spending more than a year overseas. Upon his return to Stockton, Mr. Eberhard was assigned to special development work for the U. S. Ordnance Department on self-propelled track-type gun mounts suited for high speed travel. From 1920 to 1925 he designed commercial products for the Holt Manufacturing Company and in 1925 went with the engineering staff of the Caterpillar Tractor Company at San Leandro, Calif. In 1928 he was advanced to assistant general chief engineer and in 1930 to chief engineer in charge of research. Mr. Eberhard was transferred to Peoria as chief engineer in 1933, which position he held until his recent promotion. Mr. Eberhard now has administrative direction of research, engineering, manufacturing, industrial relations and training.

Harmon S. Eberhard

Mr. Burks was born in Montana and attended the University of Montana for one year. He then moved to California, where he acquired his early engineering experience, continuing his studies through extension courses of the University of California. His first experience in the design of heavy machinery was with the Schmeiser Manufacturing Company, Davis, Calif. In 1928 he joined the engineering staff of the Western Harvester Company, Stockton, Calif. (then a subsidiary of the Caterpillar Tractor Company), and a year later was transferred to the Caterpillar company's engineering offices at San Leandro, Calif. In 1933 he was advanced from chief draftsman to supervision of experimental and research engineering at San Leandro, and in 1938 he was promoted to assistant chief engineer in charge of engine design, with headquarters at Peoria.

G. E. Burks

◆

AMERICAN LOCOMOTIVE CO.—*W. E. Corrigan,* vice-president of the American Locomotive Company in charge of munitions and miscellaneous sales, has assumed additional duties as head of Diesel engine sales. Diesel locomotive sales remain under the supervision of *Perry T. Egbert.* Mr. Corrigan, who was a captain in the artillery ordnance branch of the United States Army during the last war, has participated in the negotiation of various recent government contracts with the American Locomotive Company for the production of ordnance and other war materials. He started with the company in 1909, completed a four-year course in locomotive construction at its Schenectady, N. Y., plant, and since has served in various engineering sales capacities. He was elected vice-president in 1936.

◆

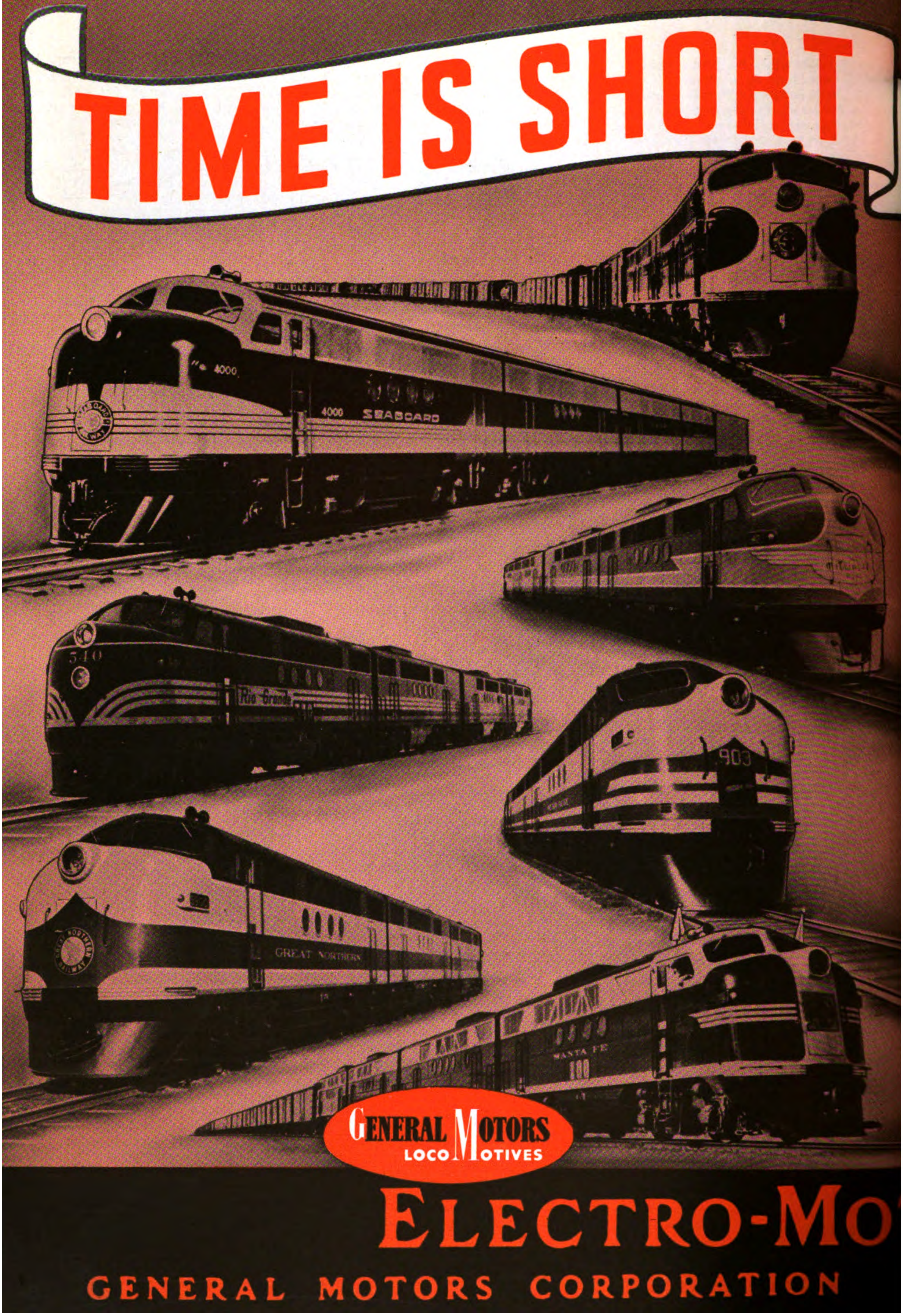
EDWIN H. BROWN, has been elected vice-president of the Allis-Chalmers Manufacturing Company in charge of engineering and development. Mr. Brown graduated from the University of Nebraska in 1906 and immediately thereafter entered the Allis-Chalmers course of training for graduate engineers. Upon completion of the two-year engineer apprentice course, he served in various capacities with the company, and then became assistant manager of the steam-turbine department. In 1935 he was promoted to manager and chief engineer of the engine and condenser department, which position he occupied at the time of election to the vice-presidency.

Obituary

WILLIAM E. WOODARD, vice-president in charge of design, and a director of the Lima Locomotive Works, Inc., died at his home, Forest Hills, L. I., on Tuesday, March 24, after an extended illness due to a heart ailment. He was also consulting engineer of the Franklin Railway Supply Company, Inc. Mr. Woodard was born in Utica, N. Y., on November 18, 1873. He attended the Utica high school and Cornell University, where he received the degree of mechanical engineer in 1896. During his career he was connected with The Baldwin Locomotive Works, Cramp Shipyard, the Dickson Locomotive Works, the Schenectady Locomotive Works, and the American Locomotive Company. His service with the Schenectady Locomotive Works, later to be merged in the American Locomotive Company, began in 1900. With the latter company he served successively as chief draftsman, manager of the electric locomotive and truck department, and assistant mechanical engineer until 1916. He was then elected vice-president of the Lima Locomotive Works, in charge of engineering. In 1925 Mr. Woodard designed the Lima A-1 locomotive, with 2-8-4 wheel arrangement, which is a prototype of the modern steam locomotive combining high speed with high horsepower capacity. It was largely through his work, first embodied in a 2-8-2 type, the Michigan Central No. 8000 built in 1922, and culminating in the A-1 design, that the horsepower has superseded the tractive-force-pound as the unit in terms of which steam locomotive capacity is customarily measured. In 1939 he introduced a new design of valve gear for poppet-valve locomotives. Mr. Woodard was the author of various papers on locomotive subjects and had been granted over 100 United States patents on improvements in locomotive and car construction. His principal inventions consisted of lightweight car trucks, height adjuster for subway cars, constant-resistance engine and trailer trucks for locomotives, locomotive throttle and throttle operating mechanism, tandem main-rod drive for locomotives, locomotive steam pipe and superheater header arrangement, articulated four-wheel trailer truck for locomotives, locomotive valve gear and poppet-valve cylinders, and a force-feed circulation boiler for locomotives. He was designated a "Modern Pioneer" by the National Association of Manufacturers in 1940, and in the same year was awarded the George R. Henderson Medal by The Franklin In-

W. E. Woodard

(*Continued on second left-hand page*)


TIME IS SHORT
4000
4000 SEABOARD
540
Rio Grande
903
GREAT NORTHERN
SANTA FE
GENERAL MOTORS LOCOMOTIVES
ELECTRO-MO
GENERAL MOTORS CORPORATION

DIESELS ARE FAST

IN America's Victory Program, the railroads rank in importance with the Army, Navy and Air Corps, and of all the indispensable parts of the war effort, transportation is the most far reaching. It enters every stage of production from the time raw materials leave the ground until the finished products reach their final destination. Troops, planes, ships, tanks, guns, shells, bombs, as well as that great army of workers in war production plants, would all be useless without transportation.

This is no time to waste time, and fortunate are the railroads using General Motors Diesel locomotives, for in them lie the advantages which are so vitally important at this time.

GM Diesel Freight Locomotives make possible:—reduction in train miles as much as 50 per cent — faster schedules with fewer service delays — increased tonnage hauling capacity — and for each Diesel operated release as many as five steam locomotives for other important services. And as more Diesels go into service, America's transportation network becomes that much stronger.

WHO SERVES THE RAILROADS–SERVES AMERICA

VE DIVISION

LA GRANGE, ILLINOIS, U.S.A.

stitute, Philadelphia, Pa., in consideration of his accomplishments in locomotive engineering and his important contributions to the field of steam locomotive design. Mr. Woodard was a member of the American Society of Mechanical Engineers, the American Society for Testing Materials, the American Railway Engineering Association, and an associate member of the Mechanical Division of the Association of American Railroads. He was a member of the Mechanical Division Committee on Further Development of the Reciprocating Steam Locomotive and also a member of the Builders' Subcommittee of the Committee on Locomotive Construction.

◆

James Harvey Williams, president of J. H. Williams & Co. of New York and Buffalo, N. Y., died in New York on February 23. Mr. Williams, who was born in Brooklyn, N. Y., on March 22, 1882, was the elder son of James H. Williams, founder of J. H. Williams & Co. Following the death of his father in 1904, Mr. Williams became vice-president of J. H. Williams & Co. and, in 1916, president. In 1923, when the Brooklyn plant was closed and its facilities consolidated with the present Buffalo works, Mr. Williams moved to Buffalo. He returned to New York in 1933 at the time the company's general offices were established in New York. Mr. Williams received his B.A. degree at Yale. He was a founder of the American Drop Forging Institute and was at one time president of the American Supply and Machinery Manufacturers' Association.

J. H. Williams

◆

George E. Howard, formerly vice-president and sales manager of the Commonwealth Steel Company, who retired in 1930, shortly after that company was merged with the General Steel Castings Corporation, Eddystone, Pa., died at St. Louis, Mo., on February 4. Mr. Howard was born at Wapella, Ill., on January 20, 1858, and worked from 1872 until 1884 as a machinist, locomotive fireman and engineer on the Union Pacific. His locomotive was No. 57 and this number became a hobby with him throughout the remainder of his life. He always obtained it on whatever he acquired which had a numerical reference. In 1884 he entered the hardware and agricultural implement business at Wood River, Neb., and in 1890 became superintendent of the Scarritt Car Seat Works at St. Louis. In 1906, Mr. Howard went with the Commonwealth Steel Company as vice-president and sales manager. After the merger of this company with the General Steel Castings Corporation in 1929, he stayed on for a few months in an advisory capacity before retiring from active business.

◆

A. Christianson, assistant to the president of the O. C. Duryea Corporation, New York, died in a sanitarium at Battle Creek, Mich., on March 5. Formerly, he was chief engineer of the Standard Steel Car Company and from July 1, 1933, until April, 1941, when he joined the Duryea Corporation, was chief engineer of the Pullman-Standard Car Mfg. Co.

◆

John F. Pratt, vice-president of the Brake Equipment & Supply Co., of Chicago, died February 28 at his home in Riverside, Ill. Mr. Pratt was connected with the Grand Trunk Railway from 1888 to 1900 and with the Great Northern Railway from 1900 to 1920. He was general storekeeper for this latter road from September, 1916, to April, 1920. From April, 1920, to July, 1925, he was general storekeeper and local purchasing agent for the Cuba Railroad, Camaquey, Cuba. He joined the Brake Equipment & Supply Co. in 1925.

◆

Edward T. Fishwick, senior vice-president and a director of the Worthington Pump & Machinery Corporation, died March 15 at his home in Glen Ridge, N. J. Mr. Fishwick had been with the Worthington organization for 49 years. He originally started with the corporation at its Cincinnati, Ohio, works. He was also president and a director of the Worthington-Gamon Meter Company of Newark, N. J.; a director of the Glen Ridge Trust Company; a director of the New Jersey State Chamber of Commerce; and was formerly head of the Diesel Engine Manufacturers' Association.

◆

Christian Davidson, Sr., a former vice-president of the Ryan Car Company, Chicago (no longer in existence) died on February 21 at his home in Chicago.

◆

Frank J. Boatright, railway department representative in New England for the Dearborn Chemical Company died February 17.

◆

John M. Lammadee, mechanical engineer for the Wilson Engineering Company, Chicago, and at one time a mechanical editor for the Railway Review, died suddenly of a heart attack at his office on February 21.

◆

Henry M. Lucas, founder and president of the Lucas Machine Tool Company, Cleveland, Ohio, died in that city on March 2. He was born in Cleveland, Ohio, on February 25, 1869, and served his apprenticeship as a machinist with the Warner & Swasey Co., which he joined in 1886. Later he became a department foreman and soon after was placed in the engineering department. He became chief draftsman in 1895 and in 1899 left this company to organize the Lucas Machine Tool Co.

Henry M. Lucas

Personal Mention

General

Otto C. Gruenberg, superintendent motive power of the New York, Ontario & Western at Middletown, N. Y., has been granted a leave of absence for the war's duration for service with the United States Army.

E. R. Buck, superintendent of motive power of the Wabash and the Ann Arbor, with headquarters at Decatur, Ill., has had his title changed to general superintendent of motive power.

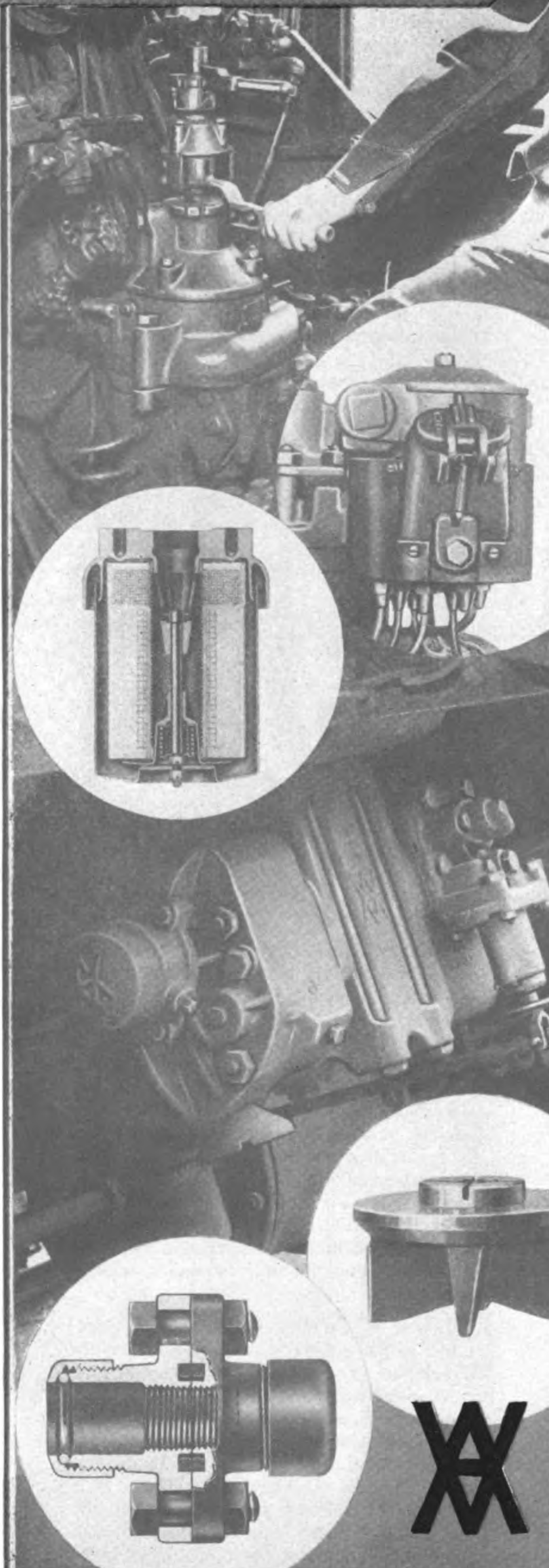
A. W. Byron has been appointed superintendent of motive power of the Eastern and Central Pennsylvania divisions of the Pennsylvania.

F. C. Wager, master mechanic of the Spokane, Portland & Seattle at Vancouver, Wash., has had his title changed to mechanical superintendent.

A. D. Williams, superintendent of motive power of the Southern Pacific at Sacramento, Calif., retired from active service on March 1.

E. E. Hinchman, superintendent of the Los Angeles (Calif.) general shops of the Southern Pacific, has been appointed assistant superintendent of motive power at Sacramento.

(Continued on next left-hand page)



A. C. Howard has been appointed assistant mechanical engineer of the Pere Marquette, with headquarters at Detroit, Mich.

A. B. Wilson, assistant superintendent of motive power on the Southern Pacific at Sacramento, Calif., has been appointed superintendent of motive power, with the same headquarters.

Walter O. Nugent, superintendent of the locomotive shops of the Canadian National at Transcona, Man., has been appointed assistant general superintendent of motive power and equipment, Western region, with headquarters at Winnipeg, Man.

R. F. Weiss, assistant to the vice-president, research and mechanical standards of the Union Pacific at Omaha, Neb., has been appointed superintendent of motive power and machinery of the Eastern district. Mr. Weiss entered railway service in 1913 as a messenger on the Union Pa-

R. F. Weiss

cific at Green River, Wyo. In 1918 he became a machinist apprentice at Cheyenne, Wyo., and in 1919 a machinist, later serving as enginehouse foreman and district foreman at North Platte, Neb. In 1936 he was promoted to assistant master mechanic at Cheyenne and less than a year later became master mechanic at Green River, later being transferred to Cheyenne. During the year 1939, he served, successively, as a special representative at Omaha, shop superintendent at Cheyenne, and master mechanic at Pocatello, Idaho. Early this year, Mr. Weiss was appointed to the temporary position of assistant to the vice-president, research and mechanical standards.

James J. Thompson, special representative in the general manager's office of the Tennessee Central, has been promoted to mechanical assistant to the president, with headquarters as before at Nashville, Tenn. Mr. Thompson was born at Roanoke, Va., on September 7, 1906, and attended Virginia Military Institute, Lexington, Va. He entered railway service in February, 1925, as a messenger in the statistical bureau of the Norfolk & Western at Roanoke, Va., transferring to the mechanical department a month later as a helper machinist in the erecting shop. He later returned to school but served subsequently between school terms and then regularly in the Roanoke shops, at Pittsburgh, Pa., Bluefield, W. Va., and the Shaffers Crossing roundhouse as special apprentice, material inspector and shop inspector. On September 1, 1937, Mr. Thompson was

James J. Thompson

transferred to the operating department as an assistant road foreman of engines at Roanoke, later being transferred to Crewe, Va., and then being promoted to assistant trainmaster, in which capacity he served on the Radford, Pocahontas and Shenandoah divisions. On November 30, 1941, Mr. Thompson resigned to go with the Tennessee Central as a special representative in the general manager's office.

John Gogerty, superintendent of motive power and machinery of the Eastern district of the Union Pacific, has been appointed general superintendent of motive power and machinery, with headquarters as before at Omaha, Neb. Mr. Gogerty entered Union Pacific service in 1918 as an enginehouse foreman at Armstrong, Wash., and then served as general foreman and district foreman at various points on the western part of the Union Pacific system until 1925, when he was promoted to the

John Gogerty

position of master mechanic at Green River, Wyo. In 1928 he was transferred to Cheyenne, Wyo., and in 1933 was appointed superintendent of shops at Omaha. In 1936 Mr. Gogerty became acting assistant general superintendent of motive power and machinery, with headquarters at Cheyenne; in 1937, assistant general superintendent of motive power and machinery at Cheyenne, and on April 1, 1940, superintendent of motive power and machinery, Eastern district, with headquarters at Omaha.

Charles M. Bowling, assistant trainmaster on the Louisville & Nashville at Latonia, Ky., has been promoted to superintendent of safety, with headquarters at Louisville, Ky., succeeding Earle G. Evans, deceased. Mr. Bowling was born at Longdale, Va., and entered railway service on November 7, 1901, as a locomotive fireman on the L. & N. at Covington, Ky. He later served as locomotive engineer, as assistant trainmaster at Paris, Ky., and as inspector of safety at Birmingham, Ala.,

Charles M. Bowling

Corbin, Ky., and Paris, Ky. On June 16, 1941, he was appointed assistant trainmaster at Latonia.

Master Mechanics and Road Foremen

W. F. Lauer, master mechanic of the Illinois Central at Memphis, Tenn., retired from active service on March 1.

E. L. Frazier, Jr., has been appointed master mechanic of the Pittsburg & Shawmut, with headquarters at Brookville, Pa.

J. A. Crunk has been appointed master mechanic of the Tennessee Central, with headquarters at Nashville, Tenn.

H. B. Payne, general foreman on the Norfolk & Western at Portsmouth, Ohio, has been appointed general master mechanic at Roanoke, Va.

Paul Thomas, master mechanic of the Pennsylvania at Chicago, has been transferred to Pittsburgh, Pa.

John C. Gunning, enginehouse foreman on the Union Pacific at Ogden, Utah, has been promoted to the position of master mechanic at Salt Lake City, Utah.

G. S. Webb, assistant master mechanic of the Pennsylvania at Columbus, Ohio, has been appointed master mechanic with headquarters at Chicago.

H. J. Kleine, master mechanic of the Pan Handle division of the Pennsylvania at Pittsburgh, Pa., has been promoted to the position of master mechanic of the

Western Pennsylvania General division, with headquarters at Pitcairn, Pa.

M. H. Losch, who has been appointed master mechanic of the Illinois and Missouri divisions and the Dupo terminals of the Missouri Pacific and of the Missouri-Illinois with headquarters at Dupo, Ill., as announced in the February, *Railway Mechanical Engineer*, was born on March 28,

M. H. Losch

1893, at DeSoto, Mo. He attended grade and high schools from 1900 to 1911, and entered the service of the Missouri Pacific on September 11, 1911, as a machinist apprentice. In September, 1916, he became a machinist at Poplar Bluff, Mo., and in October, 1917, was transferred to St. Louis, Mo. From February, 1918, to July 1, 1922, he was a machinist in the employ of the Commonwealth Steel Co., Granite City, Ill. In May, 1923, he returned to the Missouri Pacific as a machinist at St. Louis, Mo. In July, 1923, he became night enginehouse foreman at St. Louis; in January, 1924, day enginehouse foreman; on December 1, 1927, general foreman, and on January 1, 1942, master mechanic at Dupo.

Shop and Enginehouse

James Bean has been appointed superintendent of the Los Angeles (Calif.) general shops of the Southern Pacific.

R. W. Mather has been appointed assistant foreman in the machine shop of the Canadian National at Moncton, N. B.

L. M. Campion has been appointed day enginehouse foreman of the Chicago & North Western, with headquarters at Ashland, Wis.

D. E. Mackinnon, general foreman on the Canadian National at Edmonton, Alta., has been appointed superintendent of the locomotive shops at Transcona, Man.

Walter S. Hunter has been appointed to assistant foreman in the erecting shop of the Canadian National, with headquarters at Moncton, N. B.

J. C. Miller, general and erecting foreman on the New York, Chicago & St. Louis at Conneaut, Ohio, has been appointed superintendent of shops, with headquarters at Conneaut, as announced in the March issue of the *Railway Mechanical Engineer*. Mr. Miller was born on April 7, 1883, at Hubbard, Ohio. He attended high school for two years and some years later (in 1926) completed an industrial engineering course at State College, State College, Pa. He began railway service in March, 1905, with the Bessemer & Lake Erie as a boilermaker helper, and in August, 1906, became a machinist helper. On October 10, 1910, he entered the employ of the New York, Chicago & St. Louis as a machinist. He was assigned to inspect locomotives being built for the Nickel Plate by the Lima Locomotive Company in February, 1917, and, in November of the same year, became pit foreman at the Con-

J. C. Miller

neaut locomotive shop. In February, 1919, he was promoted to general foreman of the locomotive backshops at Conneaut, and in February, 1923, became shop superintendent. In December, 1931, the position of shop superintendent was abolished, and Mr. Miller became general and erecting foreman of the locomotive department. In 1941, he was president of the Locomotive Maintenance Officers' Association.

Car Department

G. E. Collins, assistant superintendent of the passenger-car shops of the Chicago & North Western at Chicago, has retired.

W. Barrer has been appointed general car foreman of the California Avenue coach yard of the Chicago & North Western at Chicago.

G. R. Andersen, district supervisor car maintenance of the Chicago & North Western at Chicago, has been appointed assistant superintendent car department, succeeding E. P. Marsh, deceased.

C. P. Nelson, general car foreman of the Chicago & North Western at Chicago, has been appointed assistant superintendent of the passenger-car shops at Chicago.

J. C. Byrne has been appointed district supervisor of car maintenance of the Chicago & North Western, with headquarters at Chicago. The position of supervisor of car maintenance held by Mr. Byrne at Green Bay, Wis., has been abolished.

W. R. Hall, supervisor of car maintenance of the Western district of the Chicago & North Western at Boone, Iowa, has been transferred to the position of supervisor of car maintenance at Chicago, and his duties have been extended to cover the system.

Purchasing and Stores

William A. Summerhays, who has been on leave of absence from the Illinois Central, serving at Washington, D. C., as a consultant to the Office of Production Management, has been appointed assistant to the vice-president, purchases and stores, with headquarters at Chicago.

Obituary

William F. Wright, purchasing agent of the Louisiana & Arkansas, with headquarters at Minden, La., died at his home at Shreveport, La., on February 19 after a short illness.

William R. Culver, superintendent of stores of the Chesapeake & Ohio, the Nickel Plate and the Pere Marquette, with headquarters at Cleveland, Ohio, died suddenly while on a train en route from Grand Rapids, Mich.

John A. Burke, supervisor of air brakes of the Atchison, Topeka & Santa Fe system, with headquarters at Topeka, Kan., died suddenly at Ft. Wayne, Ind., on February 6. Mr. Burke was active in the Air Brake Association and was a member of the executive committee of that association in 1937. He was a vice-president of the Railway Fuel and Traveling Engineers' Association at the time of his death.

Geary E. Carson, who retired as district master car builder of the New York Central at West Albany, N. Y., on June 1, 1925, died on March 19. Mr. Carson was born on January 15, 1864, at Delmont, Pa. He entered railway service with the Pittsburgh & Lake Erie on October 1, 1890, and became district master car builder of the New York Central on September 1, 1908.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

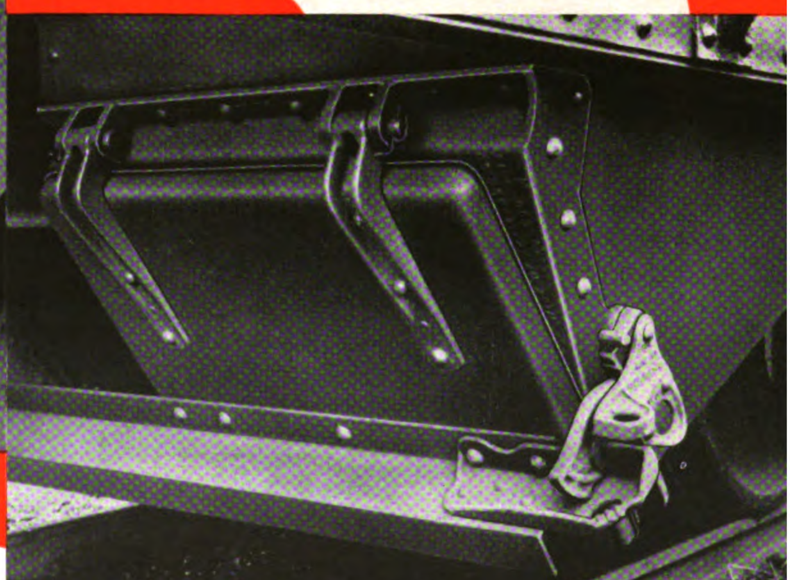
"Your Share of a Million Dollars."—The American Brake Shoe and Foundry Company, Brake Shoe and Castings Division, 230 Park avenue, New York. A 17½-in. by 14-in. book on brake-shoe research. Illustrations in color.

"General American Transportation—What It Is; What It Does."—General American Transportation Corporation, 135 South La Salle street, Chicago. Thirty-two page booklet, 9¾ in. by 12¾ in., in two colors. Explains and illustrates in detail each of the company's enterprises—The G. A. T. X. fleet; freight-car building; plate and welding division; tank storage terminals; motorcoach manufacture, and precooling division.

Railway Mechanical Engineer

May
1942

FOUNDED IN 1832



Published monthly by Simmons-Boardman Publishing Corporation, 1309 Noble Street, Philadelphia, Pa. Entered as second-class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, $3.00 for one year, U. S. and Canada. Single copies 35 cents. Vol. 116, No. 5

RAILWAY MECHANICAL ENGINEER

Founded in 1832 as the American Rail-Road Journal

With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office.

Volume 116 *No. 5*

Roy V. Wright
Editor, New York

C. B. Peck
Managing Editor, New York

E. L. Woodward
Western Editor, Chicago

H. C. Wilcox
Associate Editor, New York

J. L. Stover
Associate Editor, New York

Robert E. Thayer
Vice-Pres. and Business Manager, New York

MAY, 1942

Published on the second day of each month by

Simmons-Boardman Publishing Corporation

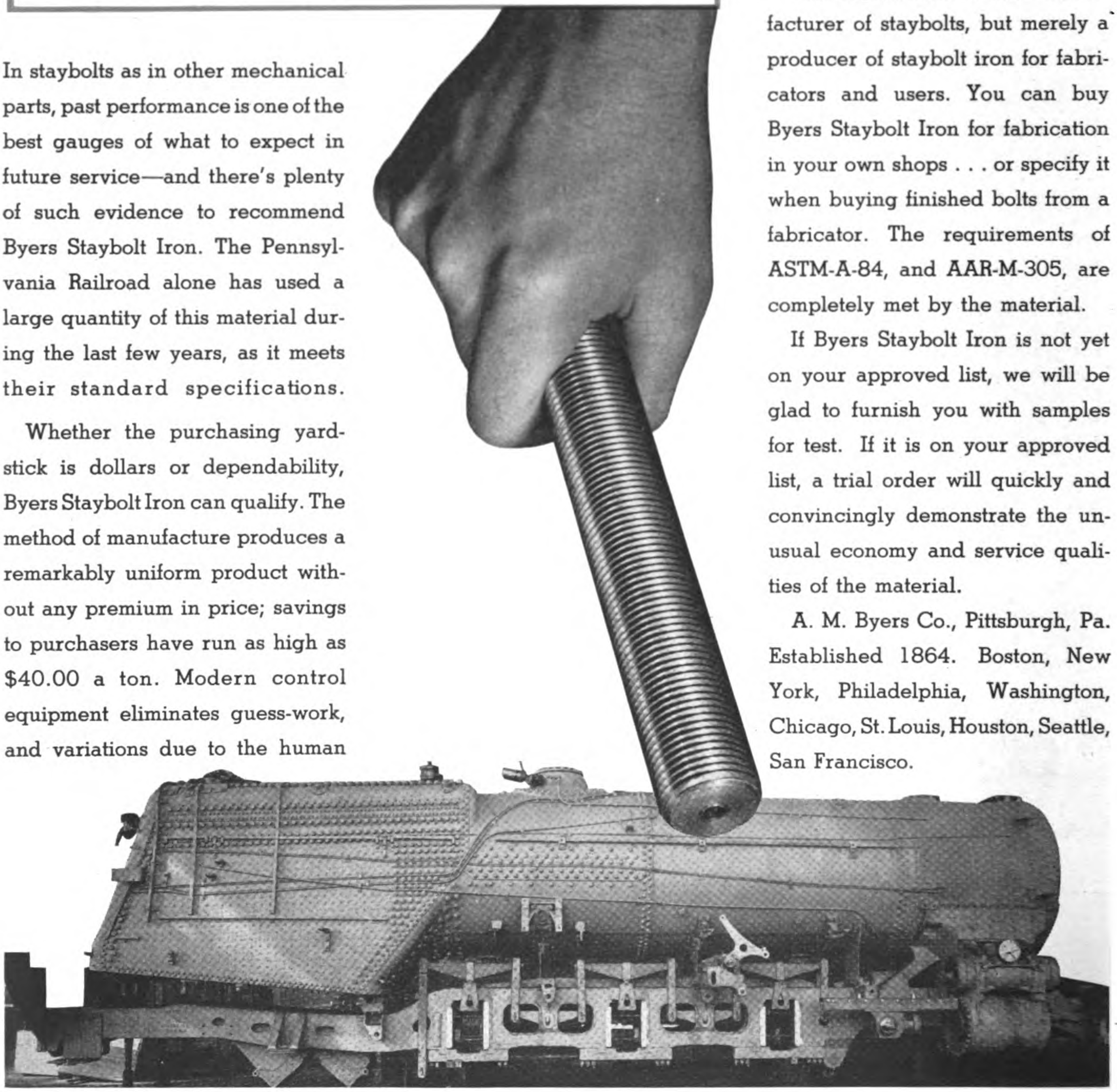
1309 Noble street, Philadelphia, Pa. Editorial and Executive Offices: 30 Church street, New York, and 105 West Adams street, Chicago. Branch offices: Terminal Tower, Cleveland; 1081 National Press bldg., Washington, D. C.; 1038 Henry bldg., Seattle, Wash.; 550 Montgomery street, Room 805-806, San Francisco, Calif.; 530 W. Sixth street, Los Angeles, Calif.

Samuel O. Dunn, *Chairman of Board, Chicago;* Henry Lee, *President, New York;* Roy V. Wright, *Vice-Pres. and Sec., New York;* Frederick H. Thompson, *Vice-Pres., Cleveland;* Elmer T. Howson, *Vice-Pres., Chicago;* Frederick C. Koch, *Vice-Pres., New York;* Robert E. Thayer, *Vice-Pres., New York;* H. A. Morrison, *Vice-Pres., Chicago;* John T. DeMott, *Treas. and Asst. Sec., New York.*

Subscriptions (including, when published, the daily editions of the Railway Age, published in connection with the convention of the Association of American Railroads, Mechanical Division), payable in advance and postage free, United States, U. S. possessions and Canada: 1 year, \$3; 2 years, \$5. Foreign countries, not including daily editions of the Railway Age: 1 year, \$4; 2 years, \$7. Single copies, 35 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.), and is indexed by the Industrial Arts Index and also by the Engineering Index Service. Printed in U. S. A.

Thousands of tons of Experience certifies BYERS STAYBOLT IRON for today's big job



In staybolts as in other mechanical parts, past performance is one of the best gauges of what to expect in future service—and there's plenty of such evidence to recommend Byers Staybolt Iron. The Pennsylvania Railroad alone has used a large quantity of this material during the last few years, as it meets their standard specifications.

Whether the purchasing yardstick is dollars or dependability, Byers Staybolt Iron can qualify. The method of manufacture produces a remarkably uniform product without any premium in price; savings to purchasers have run as high as $40.00 a ton. Modern control equipment eliminates guess-work, and variations due to the human element. From bar to bar and from order to order, properties and dimensions are duplicated. Fabricators frequently remark on the unusual trueness to round and straightness, and the freedom from surface defects, that characterize Byers Staybolt Iron.

This organization is not a manufacturer of staybolts, but merely a producer of staybolt iron for fabricators and users. You can buy Byers Staybolt Iron for fabrication in your own shops . . . or specify it when buying finished bolts from a fabricator. The requirements of ASTM-A-84, and AAR-M-305, are completely met by the material.

If Byers Staybolt Iron is not yet on your approved list, we will be glad to furnish you with samples for test. If it is on your approved list, a trial order will quickly and convincingly demonstrate the unusual economy and service qualities of the material.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

FORGING BILLETS. The same unusually high quality and uniformity found in Byers Staybolt Iron is duplicated in Byers Forging Billets—also at a material saving they are available in round, square or rectangular sections, under ASTM-A-73 and AAR-M-307 Specifications.

BYERS
GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS

RAILWAY
MECHANICAL ENGINEER

C. & O. 2-6-6-6 Locomotives

New heavy articulated locomotives are the first of their wheel arrangement. Tractive force, 110,200 lb.

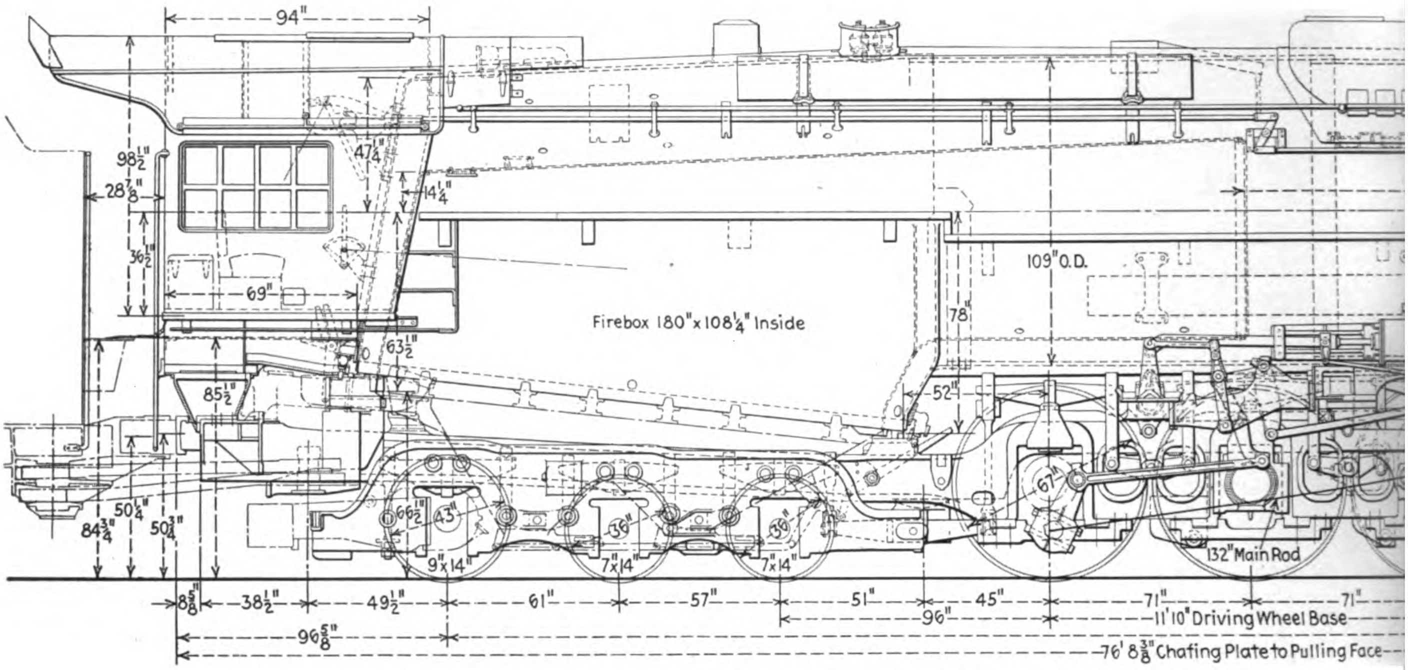
THE Chesapeake & Ohio has recently placed into service ten 2-6-6-6 type articulated locomotives which are the first of this wheel arrangement to be built. These have been designated as the Allegheny type by the railroad and were built by the Lima Locomotive Works, Inc.

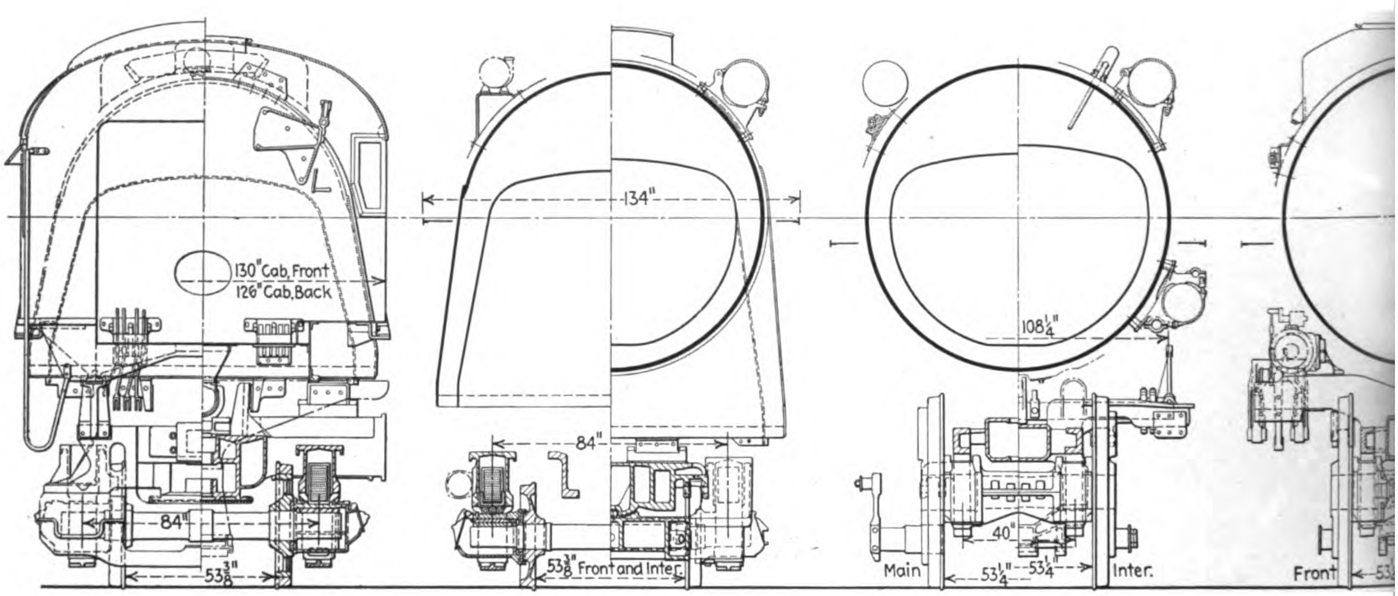
This new power is designed for operation over the heavy grades of the Allegheny mountains east of Hinton, W. Va., and will also be used to supplement the railroad company's 2-10-4 type now in operation west of Russell, Ky. The new locomotives have a tractive force of 110,200 lb. with a boiler pressure of 260 lb. and 67-in. drivers. The four cylinders are 22½ in. by 33 in. The principal weights and dimensions are shown in the accompanying tables and drawings.

In the field of heavy motive power on the C. & O. these locomotives represent an interesting comparison with the Class H-7a articulated units built in 1924 and 1926 and the Class T-1 2-10-4 type built in 1930 for service on the west end of the road between Russell, Ky., and Toledo, Ohio. A comparison of the characteristics of these three classes with two other large six-coupled locomotives of high capacity appears in an accompanying table. While the Allegheny type locomotives are designed for maximum speeds of 60 m. p.h. the objective of the design is to develop maximum continuous power output at speeds of from 30 to 35 m. p. h. The steam distribution system has been designed with a view to full capacity operation with a minimum drop in steam pressure between the dome and the cylinders.

The Running Gear

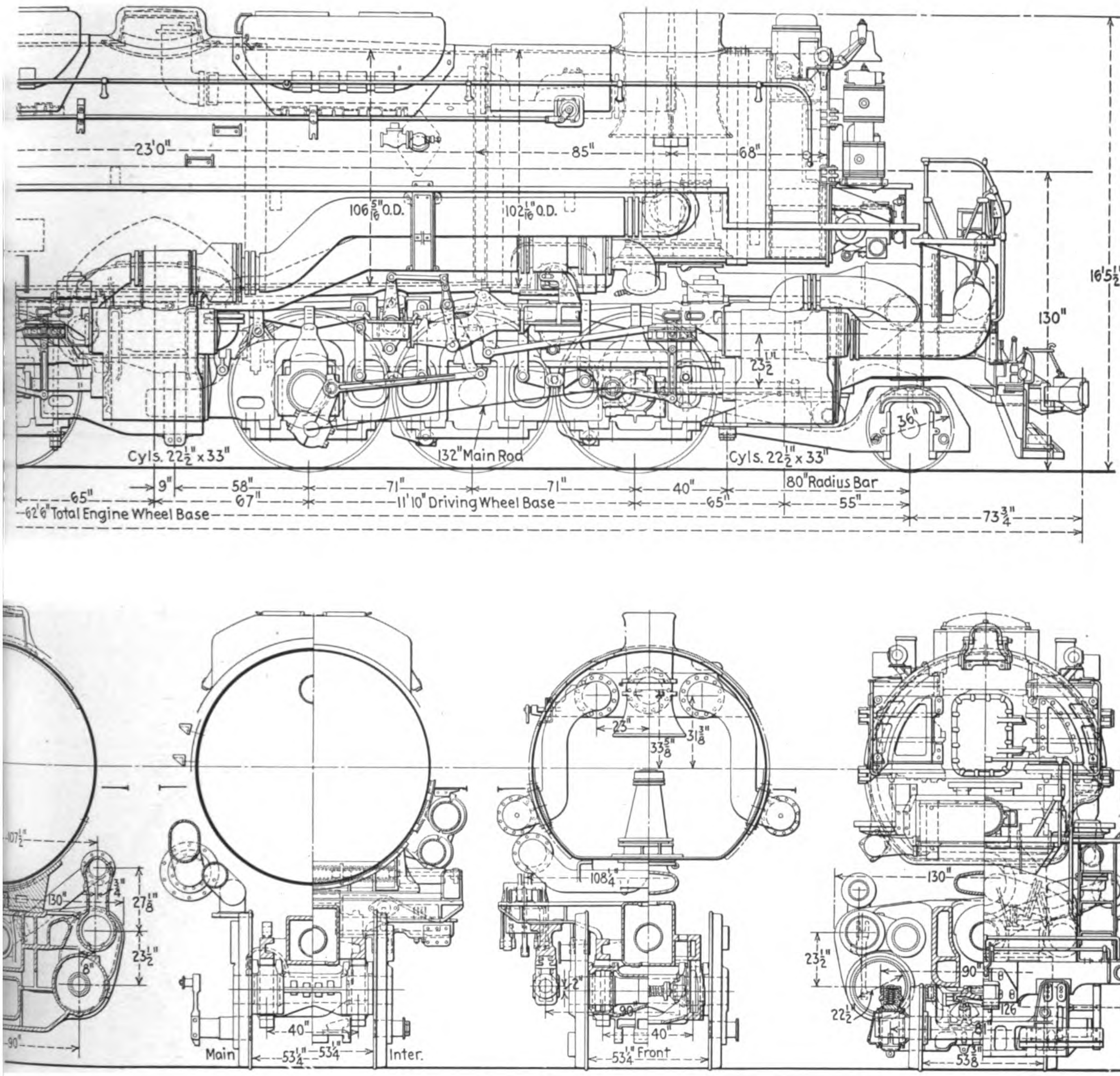
The engine beds, supplied by the General Steel Castings Corporation embrace the cylinders, back heads,





General Dimensions, Weights and Proportions o

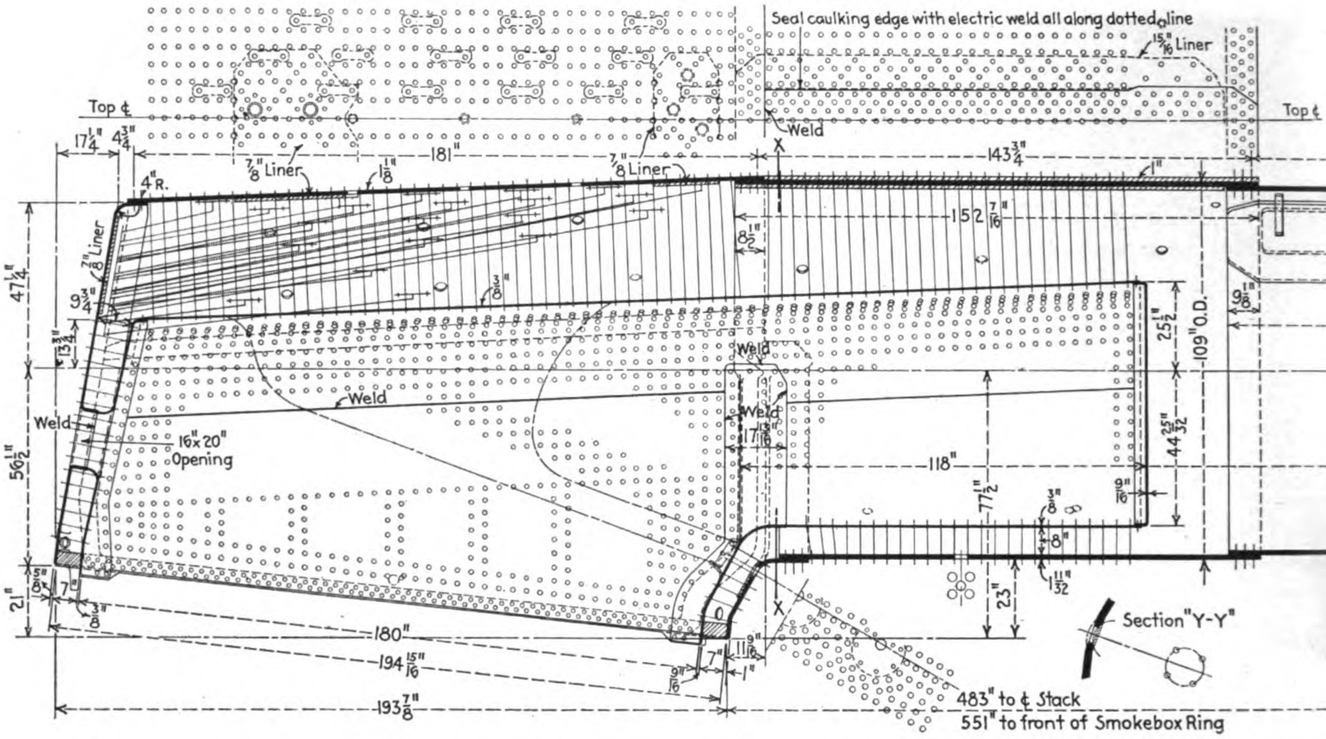
Builder	Lima Loco. Wks., Inc.
Type of locomotive	2-6-6-6
Road class	H-8
Road numbers	1600-1609
Date built	December, 1941
Service	Freight
Dimensions:	
Height to top of stack, ft.-in.	16- 5½
Height to center of boiler, ft.-in.	10-10
Width overall, in.	134
Cylinder centers, in.	90
Weights in working order, lb.:	
On drivers	471,000
On front truck	64,500
On trailing truck	189,000
Total engine	724,500
Tender (fully loaded)	(7) 426,100 (3) 437,600
Wheel bases, ft.-in.:	
Driving	34- 8
Rigid	71- 0
Engine, total	62- 6
Engine and tender, total	(7) 112-11 (3) 112- 6½
Wheels, diameter outside tires, in.:	
Driving	67
Wheels, diameter outside tires, in. (cont'd):	
Front truck	36
Trailing truck:	
Front and intermediate	36
Back	43
Engine:	
Cylinders, number, diameter and stroke, in.	4-22½x33
Valve gear, type	Baker
Valves, piston type, size, in.	12
Maximum travel, in.	8
Steam lap, in.	1 7/16
Exhaust clearance, in.	Line and line
Lead, in.	3/16
Cut-off in full gear, per cent	85
Boiler:	
Type	Conical
Steam pressure, lb. per sq. in.	260
Diameter, first ring, inside, in.	98
Diameter, largest, outside, in.	109
Firebox length, in.	180
Firebox width, in.	108⅛
Height mud ring to crown sheet, back, in.	70¼
Height mud ring to crown sheet, front of combustion chamber, in.	103
Combustion chamber length, in.	118
Thermic syphons, number	3



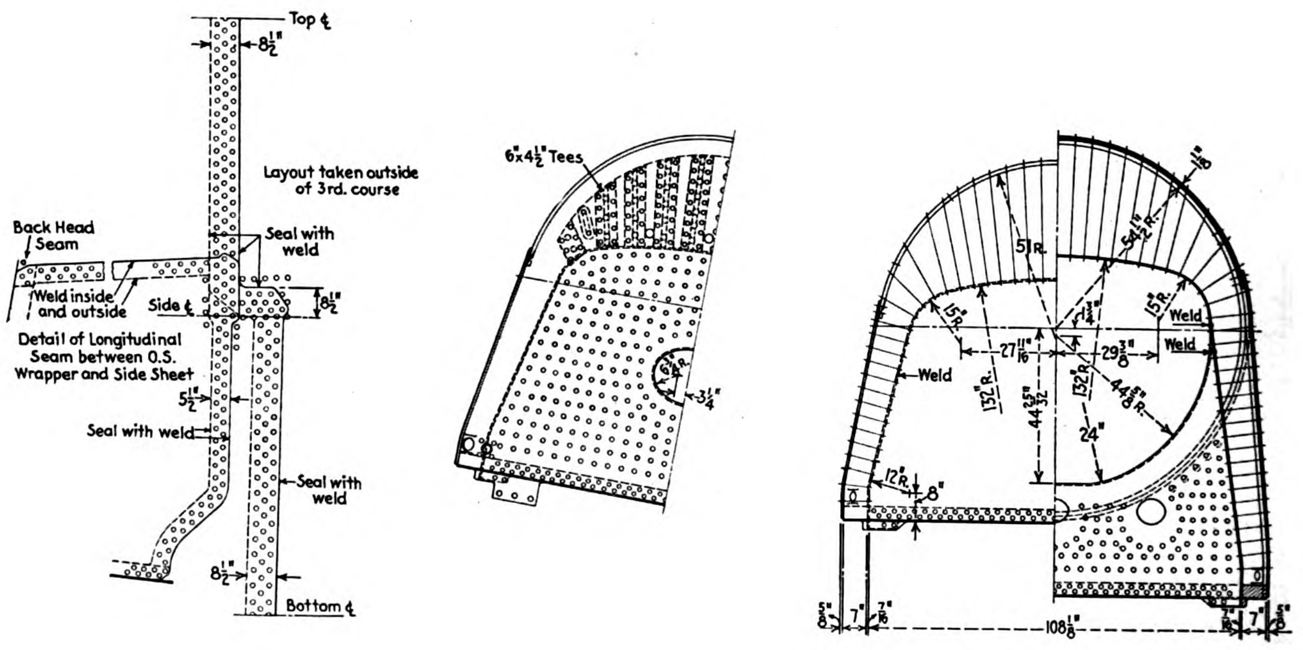
the **Chesapeake & Ohio 2-6-6-6 Type Locomotives**

Boiler, (cont'd):	
Tubes, number and diameter, in.	48-2¼
Flues, number and diameter, in.	278-3½
Length over tube sheets, ft.-in.	23-0
Net gas area through tubes and flues, sq. ft.	11.98
Fuel	Bituminous coal
Grate area, sq. ft.	135.2
Heating surfaces, sq. ft.:	
Firebox and combustion chamber	600
Thermic syphons	162
Firebox, total	762
Tubes and flues	6,478
Evaporative, total	7,240
Superheater	3,186
Combined evap. heating surface and superheater	10,426
Tender:	
Style or type	U-rectangular
Water capacity, gals.	25,000
Fuel capacity, tons	25
Trucks	Six and eight wheel
Journals, diameter and length, in.:	
Six wheel	7x14
Eight wheel	6½x12
General data, estimated:	
Rated tractive force, engine, 85 per cent, lb.	110,200
Speed at 1,000 ft. per min. piston speed, m.p.h.	36.25

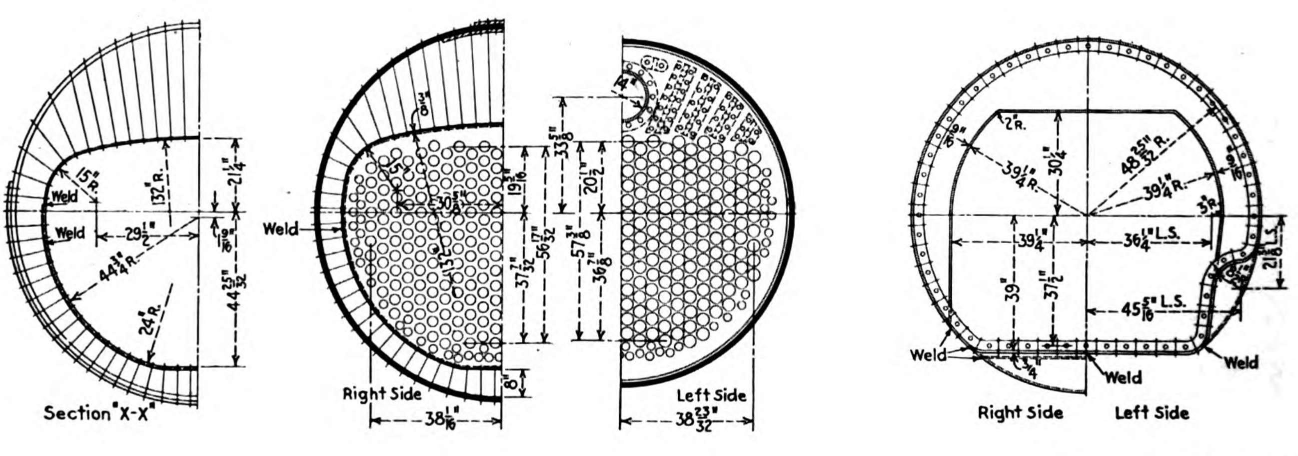
General data, estimated, (cont'd):	
Piston speed at 10 m.p.h., ft. per min.	276
R.p.m. at 10 m.p.h.	50.1
Weight proportions:	
Weight on drivers ÷ weight engine, per cent	65.1
Weight on drivers ÷ tractive force	4.27
Weight of engine ÷ evaporative heating surface	100.0
Weight of engine ÷ combined heat. surface	69.5
Boiler proportions:	
Firebox heat. surface per cent comb. heat surface	7.3
Tube-flue heat. surface per cent comb. heat. surface	62.1
Superheater heating surface per cent comb. heat. surface	30.6
Firebox heat. surface ÷ grate area	5.63
Tube-flue heat. surface ÷ grate area	47.9
Superheater heating surface ÷ grate area	23.6
Comb. heat. surface ÷ grate area	77.1
Gas area, tubes-flues ÷ grate area	.0886
Evaporative heating surface ÷ grate area	53.5
Tractive force ÷ grate area	815
Tractive force ÷ evaporative heating surface	15.2
Tractive force ÷ comb. heat. surface	10.57
Tractive force × diameter drivers ÷ comb. heat. surface	708



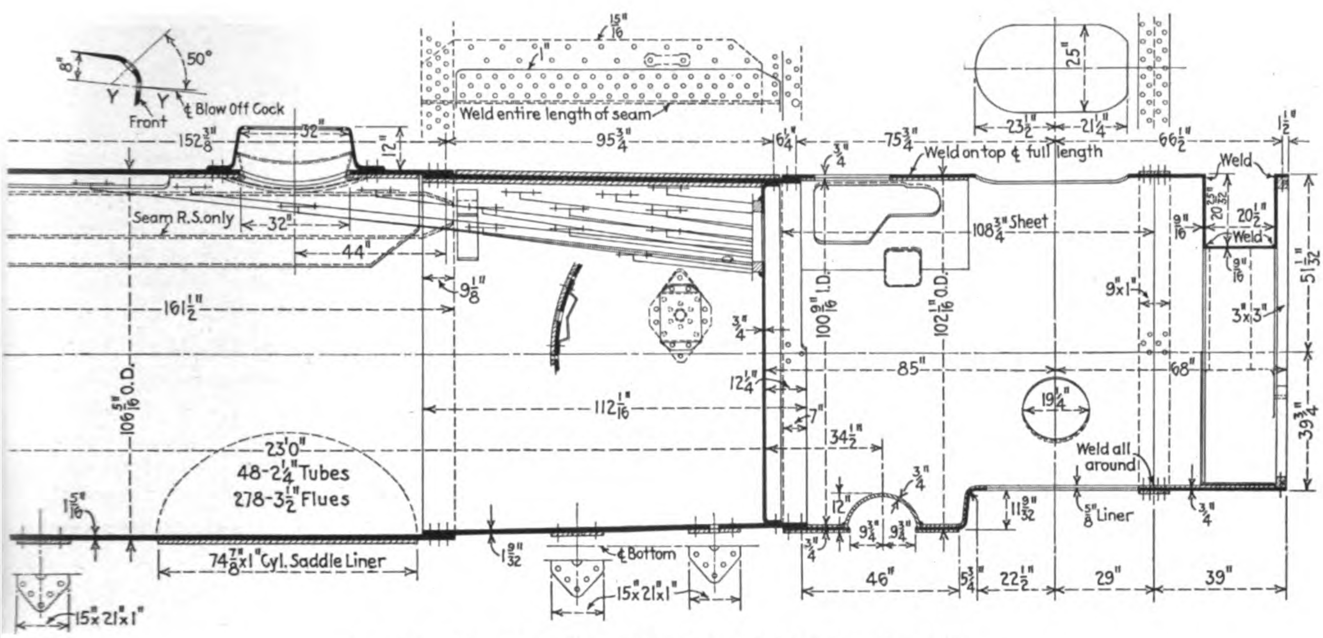
Seal caulking edge with electric weld all along dotted line
Top ℄
Weld
7/8" Liner
181"
143 3/4"
152 7/16"
109" O.D.
Weld
16"x20" Opening
118"
180"
194 15/16"
193 7/8"
Section "Y-Y"
483" to ℄ Stack
551" to front of Smokebox Ring



Top ℄
Layout taken outside of 3rd. course
Back Head Seam
Seal with weld
Weld inside and outside
Side ℄
Detail of Longitudinal Seam between O.S. Wrapper and Side Sheet
Seal with weld
Seal with weld
Bottom ℄
6"x4 1/2" Tees
Weld
108 1/8"



Section "X-X"
Weld
Right Side
Left Side
Weld
Right Side
Left Side



Elevation and cross-sections of C. & O. 2-6-6-6 locomotive boiler

Comparative Characteristics of Large C. & O. and Other Six-Coupled Locomotives

Railroad	C. & O.	C. & O.	C. & O	N. & W.	D. & R. G. W.
Wheel arrangement	2-6-6-6	2-10-4	2-8-8-2	2-6-6-4	4-6-6-4
Road class	H-8	T-1	H-7-A	A	L-105
Road numbers	1600-1609	3000-3039	1570-1589	1200-1201	3700-3709
Builder	Lima	Lima	Baldwin	R. R. Co.	Baldwin
Date built	1941	1930	1926	1936	1938
Service	Freight	Freight	Freight	Freight and Passenger	Freight
Weight on drivers, lb.*	471,000	373,000	504,500	430,100	437,940
Total engine weight, lb.*	724,500	566,000	584,600	570,000	641,900
Tender weight, lb.	426,100	415,000	376,340	378,600	394,000
Cylinders, diameter and stroke, in.	(4) 22½ x 33	(2) 29 x 34	(4) 23 x 32	(4) 24 x 30	(4) 23 x 30
Driving wheels, diameter, in.	67	69	57	70	70
Steam pressure, lb.	260	265	225	275	255
Fuel	Bit. coal	Bit. coal	Bit. coal	Bit. coal	Bit. coal
Grate area, sq. ft.	135.2	121.0	112.2	122.0	136.5
Firebox heat. surf. total, sq. ft.	600	477	467	530	613
Evap. heat. surf., sq. ft.	7,240	6,635.5	6,581	6,650	6,341
Super. surf., sq. ft.	3,186	3,030	1,885	2,703	2,628
Tractive force, engine, lb.	110,200	93,350	113,600	104,500	105,000
Tractive force, booster, lb.	None	15,275	None	None	None
Fuel capacity, tons	25	30	20	22	26
Water capacity, gals.	25,000	23,500	16,000	22,000	20,000

*Weights in working order.

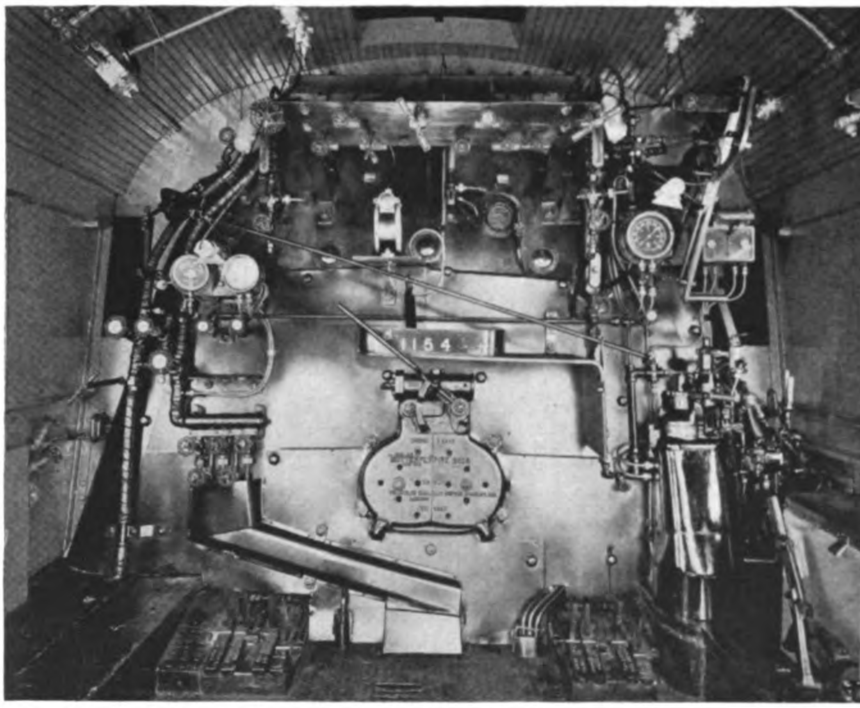
cradle, brake-hanger brackets, drawbar pockets, equalizer fulcrum pin supports, front deck, guide yoke, reverse-gear bracket and cold-water-pump bracket. The front and rear engine beds are connected at the rear cylinders by an articulation joint having a tongue cast on the front bed which fits into a pocket cast into the rear bed and secured by a hinge pin. The articulation hinge is fitted with bushings and has wear plates at the top and bottom of the pocket to insure the correct relation of the beds to each other. The hinge pin is mechanically lubricated.

The beds are designed with unusually large pedestal toes, alloy-cast-steel binders and nickel-chrome binder bolts and studs. The beds are fitted throughout with Ex-Cell-O bushings. Cast-steel frame shoes, with phosphor-bronze liners, are used to maintain the position of the roller-bearing housings in the pedestals.

A single boiler bearing of the sliding shoe type, in which is incorporated a coil-spring centering device, is used for transferring the weight of the boiler to the front engine. Sliding shoes are used at the four corners of the firebox; these are enclosed in oil-tight casings and are mechanically lubricated. In addition to these furnace bearers lateral bearers are used at the rear of the firebox.

The driving wheels are cast steel, of the conventional spoke type, with reinforced sections. They are fitted with 67-in. tires, set 53¼ in. at all driving wheels. The driving axles are hollow-bored, medium carbon steel and are mounted in Timken double roller bearings with split housings. The front drivers of each engine are equipped with the Alco lateral cushioning device.

The leading engine truck is the General Steel Castings Corporation's two-wheel outboard bearing type with 36-in. Armco rolled steel wheels mounted on medium-carbon-steel axles operating in Timken roller bearings. The six-wheel trailer truck was also supplied by the same manufacturer and is of the outboard bearing type with plain-bearing journal boxes. The trailer axles are medium carbon steel and the front and intermediate trailer axles are mounted with Armco 36-in. rolled-steel wheels while the back axle is fitted with 36-in. cast-steel centers and 43-in. tires. Rockers are used at the rear of the trailing truck with stops to limit the travel. The Timken lateral-control device is used over the front and intermediate trailer boxes. The rollers and plates



The cab is unusually roomy and the controls are well arranged

of this device are made of Timken steel and are not lubricated.

The cylinders, cast integral with the beds, have Hunt-Spiller gun-iron bushings and the piston and valve packing rings are the Hunt-Spiller combination rings. The pistons are cast steel with medium carbon-steel rods. The piston valves are 12 in. diameter, with 8-in. travel, actuated by Baker valve gear with Multiroll needle bearings, controlled in turn by an Alco Type H power reverse gear located on the rear engine. The front engine valve gear is controlled through a reach rod between the front and rear engines having universal joints and a crosshead located in the cylinder saddle. The crossheads are the multiple bearing type, of cast steel, with the bearing surfaces tin lined. The main and side rods are medium carbon steel with floating bushings of Hunt-Spiller iron and Magnus bronze at the main pin connections. The crank pins and knuckle pins are grease lubricated by the Alemite system.

In the counterbalancing of these locomotives 41.7 per cent of the weight of the reciprocating parts—2,152 lb. for each cylinder on each side—is balanced. There is an overbalance of 285 lb., 304 lb. and 309 lb. at the front, intermediate and main wheels respectively, of each engine unit. The dynamic augment at diameter speed is 16,-380 lb.

The spring rigging is of conventional design. On the front engine it is continuous from the engine truck to the main driver; on the rear engine it is continuous on each side from the front driver to the rear trailer wheel. Coil buffer springs are used in the anchor hangers of the rear engine. Ex-Cello-O bushings are used throughout the spring rigging; the pins are not lubricated.

Two Nathan Type DV-7, 36-pint mechanical lubricators are located on the left side of the locomotive and furnish engine oil to the valve-rod crosshead guides, engine-truck center pin and pedestal faces, all driving-box pedestal faces, articulation hinge pin, furnace and boiler bearing shoes, radial buffer, and trailing truck hub and pedestal faces. Two Detroit 32-pint, Model B lubricators on the right side supply valve oil to the steampipe joints, cylinders, guides, exhaust-pipe joints, feedwater-heater pumps, air compressors and stoker engine. The terminal checks of the feed lines to the latter two auxiliaries are connected to Edna automatic lubricators for stand-by lubrication.

Alemite soft grease fittings are used on the ash-pan dump shaft, brake-hanger pins, brake-cylinder levers, driving-box inside flanges, lateral-cushioning devices, engine and trailing truck rockers, trailing-truck radius-bar seat, valve gear, reverse gear and reach rods, reverse-shaft bearings, rod knuckle pins, throttle rigging, valve-rod crosshead pins, stoker gear case, tender-truck swing-hanger pins, intermediate steam pipe, front engine exhaust pipe and feedwater-heater front exhaust pipe expansion joints. Alemite hard grease fittings are applied on the main crank pins, crosshead wrist pins, back ends of the eccentric rods and on the main and side rods. The reverse-shaft reach-rod crosshead arrangement between the front and rear engines is lubricated by manually filled oil cups. The driving-axle roller bearings are oil lubricated by means of housing reservoirs.

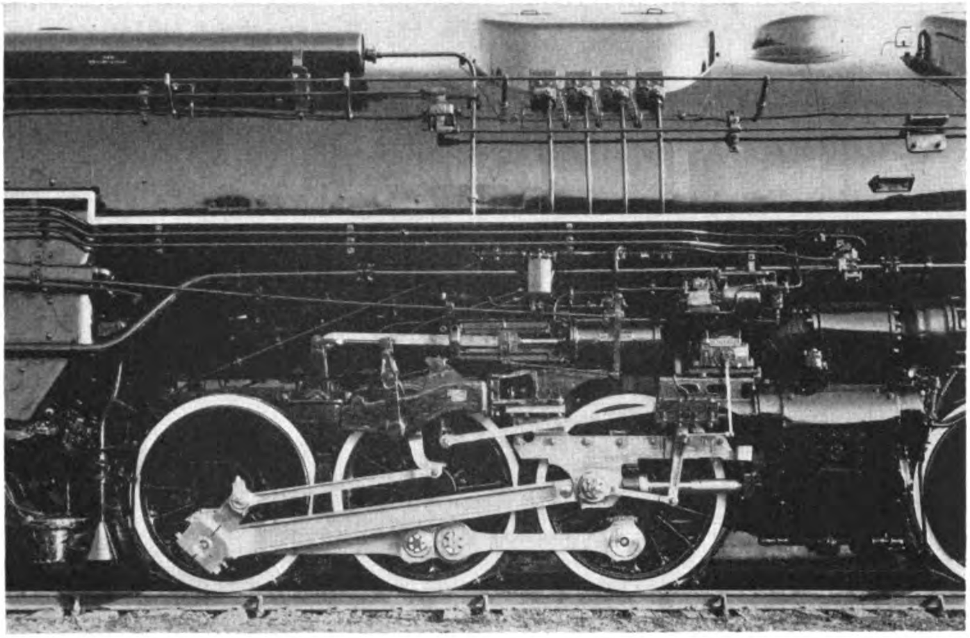
The Cab, Brake Equipment and Draft Gear

The cab is of all-welded construction, fitted with brass window sash and safety glass set in rubber. The windshields and clear-vision windows are also fitted with safety glass. The cab and deck are supported by cast steel brackets mounted on the frame cradle with expansion shoes under the rear of the cab and by the back furnace-bearer shoes at the front of the cab so that they are free to move with the boiler. Alemite lubrication is used on the sliding shoes. The cab is unusually roomy and the arrangement of all controls, gages, etc., is such as to contribute to easy and safe handling.

In addition to the driver brakes there is also single-shoe brakes on the rear trailer wheels operated by cylinders on the outside of the truck frame. The locomotive equipment is the Westinghouse No. 8 ET, with pedestal-type cab brake valves and two 8½-in. No. 150-D compressors located on the smoke box front. The compressors are operated by saturated steam and exhaust to the rear of the stack.

The locomotives are equipped with General Steel

Arrangement of the running gear of the rear engine—Both sets of valve motion are operated from a single power reverse gear



Castings Corporation's cast-steel pilot; Symington-Gould Type E coupler; Franklin Type E-2 radial buffer; Pyle-National headlight and classification lamp equipment, including headlight generator; Barco flexible connections between engine and tender as well as on air pumps and aftercooler, power reverse gear, blow-off-cock muffler and headlight generator. Byers extra-heavy wrought iron piping is used on engine and tender. Two sand boxes, with Viloco sander equipment, are used, one for each engine.

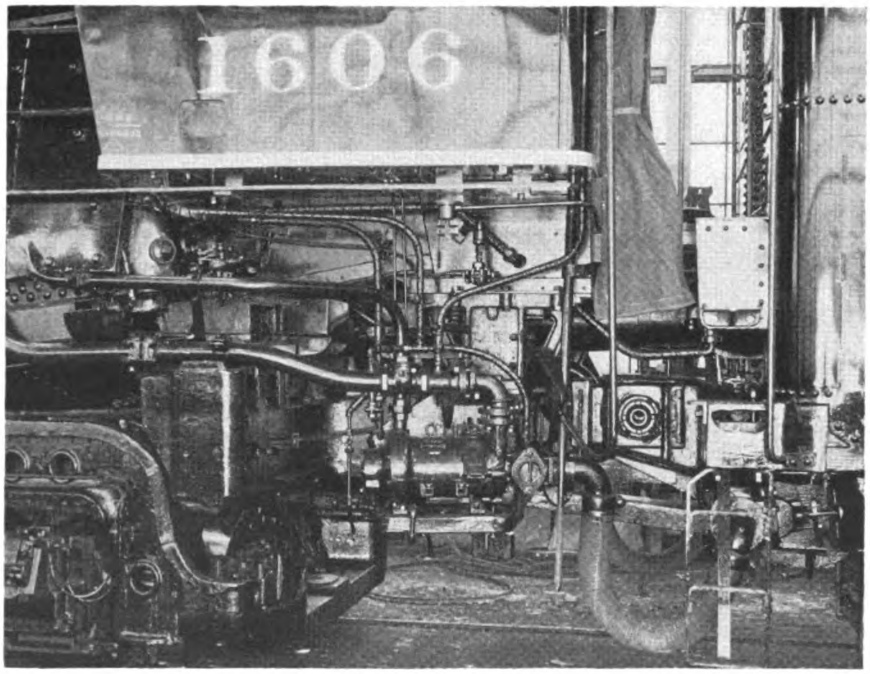
The Boiler

The boiler has an over-all length of 45 ft. 11 in. and is constructed with three barrel courses. The first course is conical, with an inside diameter of 98 in. at the front. The third course, which surrounds the combustion chamber has an outside diameter of 109 in. Both shell and firebox sheets are of carbon steel. The three shell courses have sheets 1$\frac{9}{32}$ in., 1$\frac{5}{16}$ in. and 1$\frac{11}{32}$ in. thick, respectively. The firebox roof sheet is 1$\frac{1}{8}$ in. thick. The longitudinal shell course seams are designed, with an efficiency of 86.1 per cent, with a view to reducing stress concentration to a minimum. The seams are triple riveted and caulked inside and outside.

The combustion chamber is 118 in. long and the firebox 180 in. long by 108$\frac{1}{8}$ in. wide. The crown sheet has an approximate length of 25 ft. and a total slope, from front to back, of 11$\frac{3}{4}$ in.

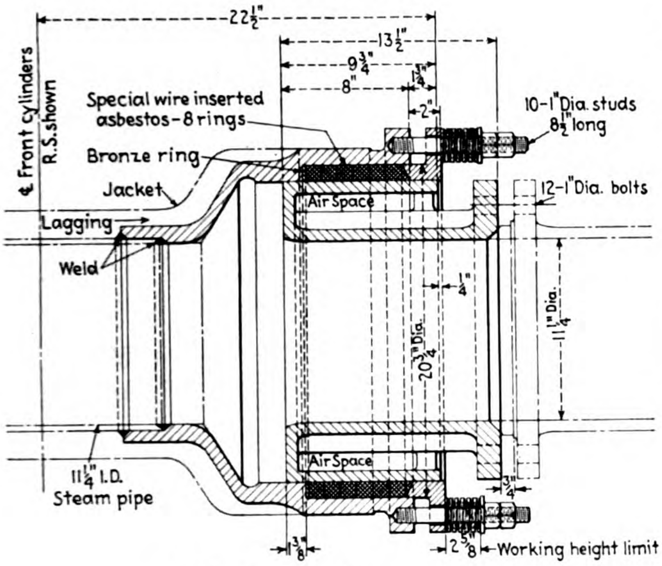
There is a full installation of flexible bolts around the combustion chamber. Flannery Type K and KJ bolts are used in the breaking zone of the side sheets; in the two boundary rows of the side sheets and of the back head. Flannery Type CK expansion stays are used at the 27 front rows of the combustion chamber, 9 rows wide. The water space rigid bolts are Alco Type P and PH.

The cold-water pump for the feedwater heater and the engine-tender connections



Partial List of Material and Equipment on the Lima-Built 2-6-6-6 Type Locomotive for the Chesapeake & Ohio

Bed frames; bumper; pilots; engine and trailer trucks	General Steel Castings Corp., Eddystone, Pa.
Engine bed bushings	Ex-Cell-O Corporation, Detroit, Mich.
Driving axles—engine and trailer truck	Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Semi-elliptic and coil spring	Pittsburgh Spring & Steel Co., Pittsburgh, Pa.
Trailer-truck lateral centering device	The Timken Roller Bearing Co., Canton, Ohio
Lateral motion devices	American Locomotive Co., New York
Radial buffers	Franklin Railway Supply Co., Inc., New York
Drawbars; safety bars; draw-bar pins	Ewald Iron Co., Louisville, Ky.
Wheels—engine and trailer truck	American Rolling Mill Co., Middletown, Ohio
Wheel centers	Lima Locomotive Works, Inc., Lima, Ohio
Tires	American Locomotive Co., Railway Steel Spring Division, New York
Journal-box lids—trailer truck	National Malleable and Steel Castings Co., Cleveland, Ohio
Coupler, pilot	Symington-Gould Corp., Rochester, N. Y.
Uncoupling rigging	Standard Railway Equipment Company, Chicago
Draft gear	W. H. Miner, Inc., Chicago
Air brakes; air-compressor aftercooler	Westinghouse Air Brake Co., Wilmerding, Pa.
Brake shoes; brake-shoe keys	American Brake Shoe & Foundry Co., New York
Foundation driving brake	American Brake Company, St. Louis, Mo.
Cylinder and boiler lagging	Johns-Manville Sales Corp., New York
Cylinder and boiler jacket	American Rolling Mill Co., Middletown, Ohio
Piston-rod and valve-stem packing	T-Z Railway Equipment Co., Chicago
Duplex combination (bronze and iron) cylinder and valve-packing rings; cylinder and piston-valve bushings; valve-chamber bushings; main rod floating bushings; piston-rod packing rings	Hunt-Spiller Manufacturing Corporation, Boston, Mass.
Cylinder-cock operating valves	The Okadee Company, Chicago
Main-rod floating bushings; rod bushings; rod brasses	Magnus Metal Div., National Lead Co., New York
Valve gear	Pilliod Company, New York
Reverse gear	American Locomotive Co., New York
Crossheads	Ohio Steel Foundry Co., Lima, Ohio
Mechanical lubricator, dividers and terminal checks for engine oil	Nathan Manufacturing Co., New York
Mechanical lubricator and terminal checks for valve oil	Detroit Lubricator Co., Detroit, Mich.
Grease fittings	The Prime Manufacturing Co., Milwaukee, Wis.
Boiler and firebox plates	Lukens Steel Co., Coatesville, Pa. Otis Steel Company, Cleveland, Ohio
Arch brick	General Refractories Company, Philadelphia, Pa.
Tubes and flues	(2) Globe Steel Tubes Co., Milwaukee, Wis. (5) National Tube Co., Pittsburgh, Pa. (3) Steel and Tubes, Inc., Cleveland, Ohio
Syphons	Locomotive Firebox Co., Chicago
Smokebox hinges	The Okadee Company, Chicago
Staybolts—rigid	American Locomotive Co., New York
Flexible staybolts; expansion stays	Flannery Bolt Co., Bridgeville, Pa.
Flexible staybolt material	Ewald Iron Co., Louisville, Ky. Old Dominion Iron & Steel Works, Inc., Richmond, Va. Joseph T. Ryerson & Son, Inc., Chicago
Boiler and firebox rivets	The Champion Rivet Co., Cleveland, Ohio
Steam and exhaust-pipe welded fittings	Tube-Turns, Incorporated, Louisville, Ky.
Steam and exhaust pipe packing	The Garlock Packing Co., Palmyra, N. Y.
Throttle	American Throttle Co., New York
Piping	A. M. Byers Co., Pittsburgh, Pa.
Pipe covering	Union Asbestos & Rubber Co., Chicago
Superheater	The Superheater Company, New York
Stoker	Standard Stoker Co., Inc., New York
Grates	Waugh Equipment Co., New York
Fire door	Franklin Railway Supply Co., Inc., New York
Feedwater heater	Worthington Pump & Machinery Corp., Harrison, N. J.
Injectors	Nathan Manufacturing Co., New York
Blow-off cocks	T-Z Railway Equipment Co., Chicago
Blow-off muffler	Wilson Engineering Corp., Chicago
Washout plugs	American Locomotive Co., New York Huron Mfg. Co., Detroit, Mich.
Drain cocks; cylinder cocks	Barco Manufacturing Co., Chicago The Okadee Company, Chicago
Turret valves; injector check valves; boiler checks	Nathan Manufacturing Co., New York
Valves—blower, stoker engine and feed pump throttle	The Lunkenheimer Company, Cincinnati, Ohio
Valves—superheat lines	Walworth Company, New York
Valves—globe and angle	Crane Co., Chicago
Feed-pipe strainer	The Okadee Company, Chicago
Suction hose	Hewitt Rubber Corp., Buffalo, N. Y.
Sander equipment	Viloco Railway Equipment Co., Chicago
Whistle	Nathan Manufacturing Co., New York
Whistle-operating valve	Viloco Railway Equipment Co., Chicago
Low-water alarm	Nathan Manufacturing Co., New York
Cab-window sash	The O. M. Edwards Co., Inc., Syracuse, N. Y.
Cab windshields; clear-vision windows	The Prime Manufacturing Co., Milwaukee, Wis.
Cab seat cushions	United States Rubber Co., New York
Metal cab seats	Van Dorn Iron Works, Cleveland, Ohio
Running boards; cab deck	Alan Wood Steel Co., Conshohocken, Pa.
Flexible connections between engine and tender; air reservoir, air-compressor, power reverse gear, blow-off cock muffler, generator, aftercooler, and blower connections	Barco Manufacturing Co., Chicago
Headlight and headlight generator; classification and back-up lamps	The Pyle-National Company, Chicago
Tender:	
Frame	General Steel Castings Co., Eddystone, Pa.
Trucks, front:	
Six-wheel	(7) Buckeye Steel Castings Co., Columbus, Ohio (3) General Steel Castings Co., Eddystone, Pa.
Eight-wheel	(7) Buckeye Steel Castings Co., Columbus, Ohio (3) General Steel Castings Co., Eddystone, Pa.
Wheels	American Rolling Mill Co., Middletown, Ohio
Axles	Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Journal-box lids	National Malleable and Steel Castings Co., Cleveland, Ohio
Truck snubber springs	Cardwell Westinghouse Co., Chicago
Clasp brakes	American Steel Foundries, Chicago
Bearings	Magnus Metal Div., National Lead Co., New York
Bearings and wedges	Standard Forgings Corp., Chicago
Couplers	Buckeye Steel Castings Co., Columbus, Ohio
Tank plates	(6) Carnegie-Illinois Steel Corp., Pittsburgh, Pa. (4) Republic Steel Corp., Massillon, Ohio
Tank valves	Wm. Powell Co., Cincinnati, Ohio
Paint	E. I. du Pont de Nemours & Co., Wilmington, Del.



Sectional detail of expansion joint

Seal welding is used at the seams joining the wrapper side and roof sheets at firebox mud-ring corners and at the caulking edges of longitudinal barrel course seams. The firebox and combustion-chamber seams are all welded except the back head and inside door-sheet seams, which are riveted. The firedoor seam, the tube-sheet-ring seam and the smokebox joints are also welded.

The firebox has three syphons located in line transversely and connected from crown to throat. The superheater is the Type E with an American multiple throttle in the header. The feedwater heater is the Worthington Type 6½ S with the Type 6½ SA hot-water pump located under the air compressors. The cold-water pump is under the left side of the cab. The feedwater heater capacity is 14,400 gal. per hour. A Nathan Type 4000 automatic restarting injector has a capacity of 14,500 gal. per hour.

The fireboxes are fitted with Firebar grates having approximately 25 per cent air openings. The fuel is bituminous coal which is fed by a Standard Type MB stoker. The firedoor is a Franklin butterfly Type No. 8. The boilers are equipped with Nathan Type B low-water alarms and water circulators are applied to the first course, right side. T-Z blow-off cocks are located at the four firebox corners, the two forward blow-off cocks discharging through a Wilson centrifugal muffler on top of the boiler.

Steam Distribution System

Steam is taken from the superheater header through pipes inside the smokebox to outside pipes located on each side of the boiler. Through these outside pipes the rear cylinders are supplied. At the rear cylinders the steam supply is divided, half going to the cylinders and the remainder passing through a Y-pipe to the intermediate receiver pipe which is supported from the front engine bed. The receiver pipe passes through the front cylinders to another Y-pipe, by means of which delivery to the front engine cylinders is effected. Three expansion joints are used, one in each of the right and left outside steam pipes to the rear engine cylinders and one in the receiver pipe at the front engine cylinders. They are so designed that the surfaces bearing against the packing are separated by an open air space from the steam-containing walls of the joint. The receiver pipe is fitted with a ball joint at the rear engine cylinders.

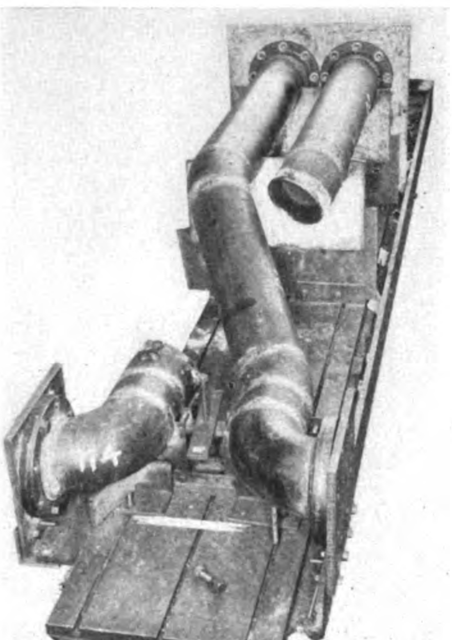
The exhaust-pipe arrangement is similar to that used by the C. & O. on its Class H-7a articulated locomotives. The cylinders of the rear engine exhaust through separate pipes on the right and left side to the rear exhaust stand where the steam from both cylinders passes through the same nozzle. The front engine cylinders exhaust into a Y-pipe and then through a single pipe to the front exhaust stand. The nozzles have 7-in. openings with ½-in. square cross-bridges. Separate exhaust pipes, with suitable ball and expansion joints, supply steam to the feedwater heater.

A detail of one of the expansion joints, showing the manner in which the packing is protected from steam temperature by an air space, is included in an accompanying drawing.

The steam and exhaust piping is fitted with Tube-Turn welded flanged fittings. In fabricating the piping templates were made as a result of which the entire piping system, with the flanged fittings, was assembled without need for alteration. High-tensile-steel bolts were used in the flanged fittings. Garlock packing was used in all the ball and expansion joints of the steam and exhaust system.

The Tenders

The tenders are the rectangular U type with a fuel capacity of 25 tons and 25,000 gal. of water. The tender frame, supplied by General Steel Castings Corporation, is a one-piece water bottom steel casting. The tender tank is of the riveted type. The tank plates are of



A set of pipes with welded fittings and Tube Turns on the jig ready for welding

carbon steel, the outside plates being 5/16 in., the top plates ⅜ in. and the slope plates ⅜ in.

The front tender trucks are the six-wheel type and the rear trucks are the eight-wheel type. Seven of the ten tenders are equipped with trucks furnished by the Buckeye Steel Castings Corporation and three are equipped with General Steel Castings Corporation trucks. The six-wheel trucks have 7-in. by 14-in. journals and the eight-wheel trucks have 6½-in. by 12-in. journals. All journals have plain bearings, with brasses furnished

(*Continued on page 216*)

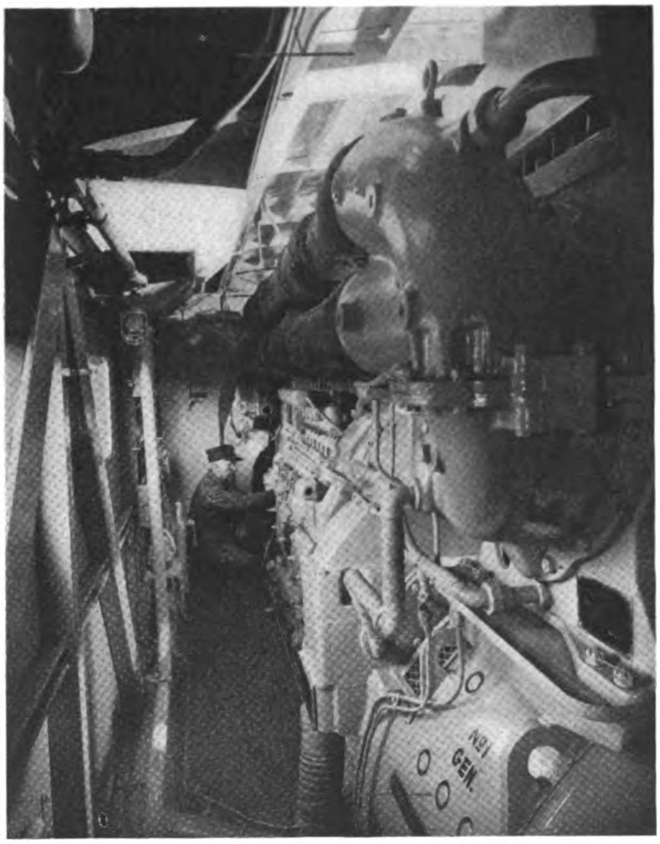
New Haven

2,000-Hp. Locomotives

Twenty new Alco-G.E. Diesel-electric units have starting tractive force of 139,000 lb. and are designed for maximum speeds of 80 m.p.h.—Assigned to both freight and passenger service

In December, 1941, the New York, New Haven & Hartford received the first of 20 Diesel-electric locomotives of 2,000 hp. each designed for both passenger and freight service. The locomotives were designed and built by the American Locomotive Company in cooperation with the General Electric Company. They consist of 2,000-hp. units which are coupled for multiple-unit operation from the engineman's cab at the front of the leading unit. There are two 1,000-hp. Diesel engines in each unit, all four engines being controlled by the throttle. The new locomotives are geared to travel at a top speed of 80 m. p. h.

Each locomotive unit is carried on two six-wheel swivel-type equalized trucks. These trucks are of the



The engine compartments are well arranged and roomy

General Steel Castings Corporation's design and are built with swing bolsters and one-piece frames, both of which are cast from alloy steel resulting in a light-weight truck. The trucks are identical in every respect and are equipped with 40-in. rolled steel wheels and Timken roller bearings.

The weight distribution between the three axles of each truck is quite uniform, even though the traction motors are mounted on the two outside axles and the middle axle is an idler. By this arrangement the center plate and swing bolster serve as an air passage to the motors so it is unnecessary to employ canvas or rubber boots, difficult of access, for carrying air to the motor.

The motor-truck center plate is provided with a wear-resisting steel liner and is oil lubricated, provision being made to regulate the level of the oil so that it will not flow over into the blower passages. The center plate is also fitted with a seal to prevent entrance of dust and dirt.

The trucks are fitted with clasp brakes and four operating cylinders, the braking ratio being 75 per cent with 50 lb. pressure in the cylinder. The brakes are operated by Westinghouse schedule 8-EL brake system. Automatic slack adjusters are used on all cylinders. The trucks are equipped with automatic sanders arranged to sand the front and back of the truck.

The truck frame is carried at four points by helical springs resting on the four equalizers. The truck bolster is likewise supported at four points by triple elliptic springs supported on spring planks which are attached to the truck frame by swing links. This creates a simple and rugged assembly which is unencumbered by intricate stabilizing devices.

With this design the tractive force and braking power pass through the center plates of the truck into the underframe. Consequently, each end of the underframe is equipped with suitable draft gear. Standard A. A. R. couplers, exposed type, are used at both ends of each unit.

Power Plant

The power plants have been designed as units, each independent of the other, and are located in the cab adjacent to their respective cooling radiators. Power is derived from the American Locomotive Company, six-cylinder, four-cycle Diesel engine with 12½-in. by 13-in. cylinders, equipped with a Buchi turbo-charger (exhaust-gas driven) and delivers 1,000-hp. at 740 r. p. m. for traction purposes. Additional features of this engine are its welded steel base and the built-in air compressor. This compressor is a Westinghouse 2-CD, two-stage compressor of 144 c. f. m. displacement at 740 r. p. m., thus the entire locomotive has a compressor capacity of 456 c. f. m.

The engine is fundamentally the same engine as furnished the New Haven in 1930 on its first Diesel switcher except that the first engine was not turbo-charged. By using turbo-charging, it is possible to build these high-speed Diesel passenger and freight locomotives in an

accessible, compact form and still retain the heavy-duty construction of the Alco engine.

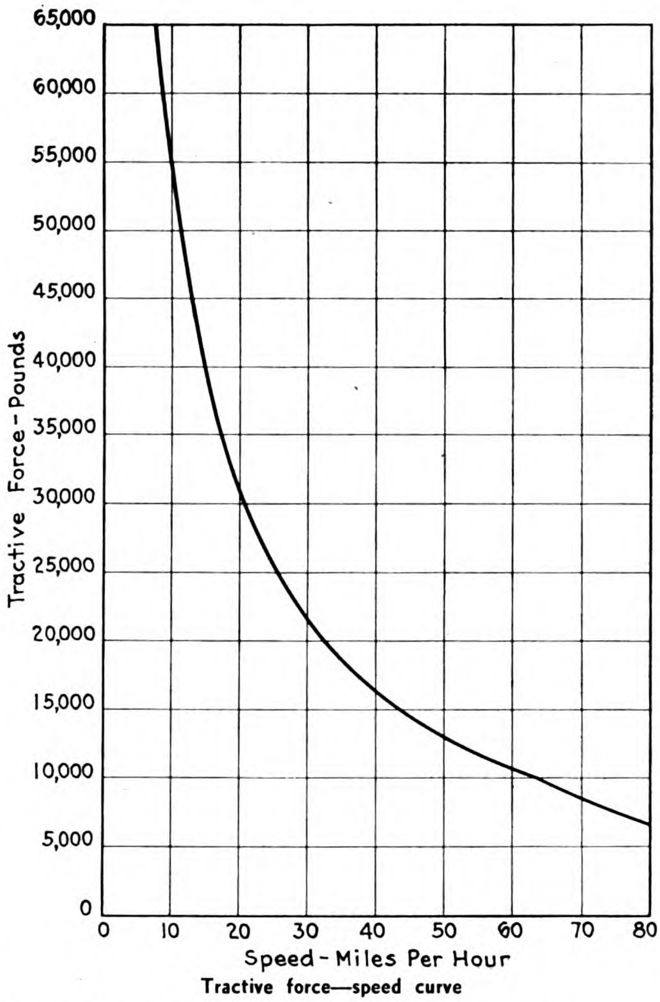
A Sturtevant blower is mounted adjacent to the engine and provides air for the traction motors. The blower is driven by V-belts from a pulley on the extension of the main engine shaft. The blower is mounted directly above the center-plate casting and delivers air through the center plate into the bolster.

Adjacent to each engine is a radiator compartment fitted with fin-tube radiators for cooling the water and lubricating oil. These radiators are set flush with the side of the cab and are fitted with shutters for regulating the flow of the air, and by-pass shutters to relieve the strain on the radiator shutters when completely closed. The radiator system is sufficiently large to meet the most severe operating requirements. Air is drawn through the radiators by a 54-in. G. E. Aphonic fan driven by V-belts from a pulley on the extension of the main engine shaft.

Electrical Equipment

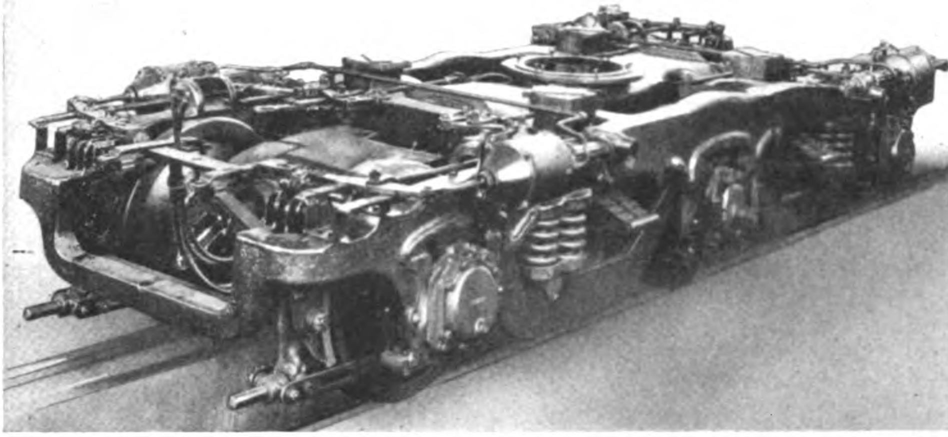
The electrical equipment is built entirely by the General Electric Company. It includes two main traction generators per unit, together with a directly connected auxiliary generator, a belt-driven exciter, four GE-726 series traction motors and complete type P control equipment.

The main generator is supported by the engine frame and two spring-loaded feet attached to the generator frame. This construction insures alinement between the engine and the generator armature. A single self-alining roller bearing is used at the outboard end of the armature shaft. A split-pole exciter furnishes excitation to the main generator, an auxiliary generator supplies power for the control circuits, the electrically operated auxiliaries and for charging a 32-cell starting and lighting battery. Each main generator furnishes power for two direct-current commutating-pole traction motors. These motors are supported in the locomotive truck by sleeve-type axle bearings and spring nose suspension from the truck frame. The motor armature bearings are the roller type. The armature shaft is so installed that it can be removed without disturbing the windings or commutator. The motor frame is an integral steel casting and has large openings for inspecting brushes.



Tractive force—speed curve

The type P single-end, multiple-unit control functions with a minimum of attention on the part of the engine operator. The initial movement of the locomotive throttle closes contacts which operate the main circuit and field contactors. Additional movement of this throttle controls each engine governor, regulating the



One of the six-wheel motor trucks — The motors are geared to the outside axles

speed of the locomotive. The traction-motor reverser and line contactors are pneumatically operated and the remaining contactors magnetically operated.

Each pair of traction motors is arranged for series, parallel and shunt-field operation. The motor connections are changed automatically from series to parallel and from parallel-full-field to shunt field.

Automatic transfers are made not only at rated engine speed but over the entire operating speed range of the engine. The relay which effects this automatic control materially increases the engine utilization during partial control and as a result more rapid acceleration as well as higher average and top locomotive speeds are obtained when operated at reduced engine speeds. A wheel-slipping relay with a buzzer warns the operator when any pair of wheels slips.

Principal Characteristics of New Haven 2,000-Hp. Diesel-Electric Locomotives

Total continuous tractive force, lb.	50,400
Total starting tractive force, lb.	139,000
Maximum speed restriction, m.p.h.	80
Diameter of wheels, in.	40
Wheelbase, motor truck, ft.-in.	15-4
Center to center of trucks, ft.-in.	43-0
Wheelbase, on unit, ft.-in.	58-4
Wheelbase, two combined units, ft.-in.	130-8
Overall length (pilot to coupler) one unit, ft.-in.	74-3¾
Overall length, two combined units, ft.-in.	148-7½
Maximum curve, deg.	21
Width over panels, ft.-in.	9-10½
Width, maximum (over handles, etc.), ft.-in.	10-6
Height, top of rail to cab roof, ft.-in.	13-6
Height, top of rail to top of ventilators, ft.-in.	14-4
Fuel tank capacity (two tanks), gal.	2,400
Total sand capacity, cu. ft.	32
Water tank capacity (two tanks), gal.	2,050
Weight on driving axles (one unit), lb.	231,000
Weights on idler axles (one unit), lb.	115,500
Total (one unit), lb.	346,500
Total (two units), lb.	693,000

A multi-button switch at the operating stations gives the engineman control of the fuel pump, engine starting and the several lighting circuits.

Cab and Superstructure

The cab is a truss structure in which the underframe is stiffened by two deep side trusses, one on each side of the cab. These side trusses support the roof, as well as provide a mounting structure for the side panels. The roof is equipped with hatches through which the power plant and steam generator can be removed. The side panels carry no load beyond their own weight. They are of Plymetl. Each panel is hermetically sealed by folding over at the ends of the panel and soldering the stainless outside face to the Galvannealed interior surface. Strips hold the panels in place by clamping a soft-rubber channel on their edges. Shatter-proof glass windows, several of which are hinged for ventilating purposes, are set in stainless-steel frames in the side panel.

The streamline end of each unit is made of $\frac{3}{16}$-in. steel plate, heavily braced. Within the nose thus formed are located the air-brake and train-control equipment. The headlight is built into the nose so that its lens is sealed in and the interior of the headlight is accessible through a drop door from within the nose.

The operator's compartment is located just back of the nose and is raised above the level of the engineroom floor. Both the operator and his assistant have deeply upholstered adjustable seats located on the platforms. From these they have an unobstructed view out over the cab nose. The divided front windows are of shatter-proof glass ⅝ in. thick. These windows are sloping and are provided with a defrosting arrangement, windshield wipers and sun visors.

The operator's compartment is separated from the engineroom by an insulated partition. The ceiling has been given a sound-absorbing surface and insulation. The floor is covered with battleship linoleum cemented to a heavy plywood base. This compartment is equipped with drop windows and no-draft ventilation, also with doors leading to the compartment end or nose and to the engineroom compartment, and one outside door on each side. Fin tube radiators provide steam heat for the compartment.

The control and other operating equipment in this compartment is greatly simplified. The usual brake valves, and sander, bell, horn and headlight controls are present, along with a small electrical controller. This controller has but two levers; one is the reverse lever and the other controls the throttle operating mechanism for all four Diesel engines. By making the electrical equipment fully automatic, much complication was avoided in both the equipment and in the operation of the locomotive. The operator merely moves the controller handle to the notch in which he wishes to operate and the automatic control determines the motor connections. A signal lamp indicates wheel slipping.

In the cab are also signal lights for overheated engines, low lubricating-oil pressure and steam-heat generator trouble. Both units register on these lights, for, like the control, the signal wires are carried in the train-line jumpers. The operator has a speed indicator before him while his assistant has gages showing the fuel and water supply on hand.

In addition to the main control, levers and switches in the operator's cab, each Diesel engine has its own start-and-stop switch, located on the wall convenient to the

engine, which permits each engine to be started or stopped independently of the other.

Auxiliary Equipment

In each unit, there is a Clarkson steam generator rated at 2,250 lb. of steam per hour. This is a flash-type steam generator and is automatic. Also in each unit is an electrical control compartment. Here all the contactors, reversers and relays are located. The cabinets are divided so that the power circuits of each power plant are separate in all respects. All wiring is enclosed in metal conduit and the leads from the battery box come directly into the cabinet.

Each unit is equipped with a 32-cell Exide battery located beneath the underframe in a compartment built into the water tank so that it is easily accessible and well protected. Also beneath the cab and between the trucks are the fuel-oil tanks and the air reservoirs. The air reservoirs have a total capacity of 62,000 cu. in. per unit, or 124,000 cu. in. for both units.

The locomotive is finished in accordance with the New Haven's regular practice for streamline locomotives; the exterior of the cab is painted Pullman green with gold stripes, figures and letters. The New York, New Haven & Hartford monogram appears in black letters on the front of each streamline nose. The parts below the cab are painted black.

Operating Assignment

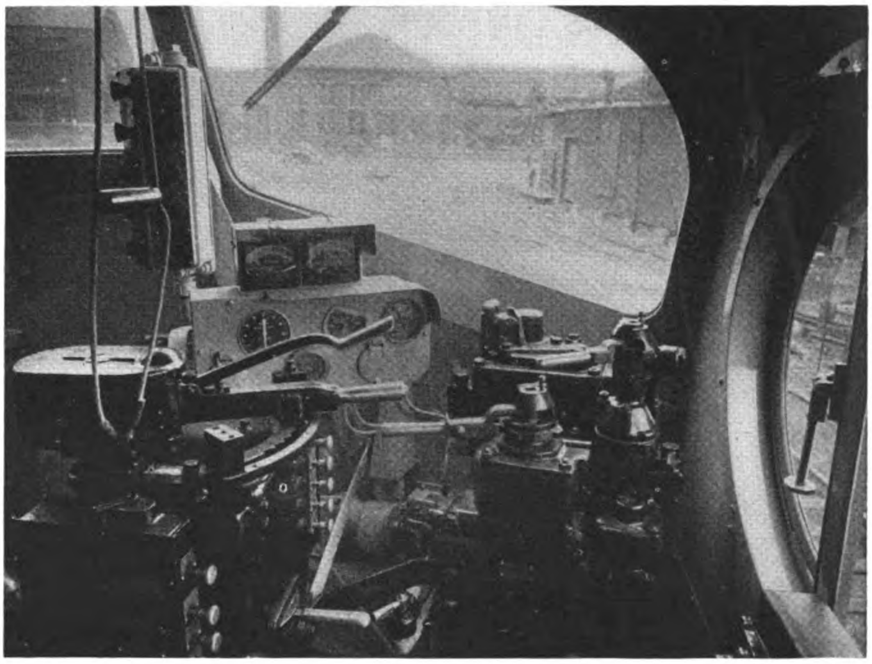
Enginemen of regular passenger and manifest freight trains, to which the new locomotives were assigned for their initial revenue hauls, were instructed by the road foreman of engines until qualified in their operation. As the locomotives were recently assigned, before the eighth unit was delivered, they comprised a pool of seven interchangeable 2,000-hp. units, all in through passenger and freight service between Boston, Mass., and New Haven, Conn., as single or double units, according to the size of the train.

For easy identification, we may take the seven individual locomotive units A, B, C, D, E, F and G, and follow A through the cycle.

At 8 a. m. unit A leaves South Station, Boston, on passenger train No. 7, The Murray Hill, arriving at New Haven, a distance of 157 miles, at 11:15 a. m. with stops at Providence, R. I., Westerly, Conn., New London and Saybrook. At 12:40 p. m., one hour and twenty-five minutes after the scheduled arrival at New Haven, unit A returns eastward with passenger train No. 188, the Pilgrim, arriving at Boston at 3:55 p. m., after five intermediate stops. Unit A then runs to the outbound Boston freight yard and couples on to a symbol freight train, designated NE-1, departing at 5:15 p. m., one hour and twenty minutes after arrival in passenger service, due at New Haven, Water street yard, at 10:00 p. m. One hour later, at 11:00 p. m., unit A is scheduled to leave New Haven, Water street yard, with symbol freight train HB-2, due at Boston at 3:50 a. m. On Sunday this unit covers train No. 27, the Merchants Limited, leaving Boston at 5:00 p. m., due at New Haven at 7:51 p. m., this in lieu of symbol freight train NE-1 which does not operate on Sunday.

In a similar fashion units B and C operate through Boston-New Haven service on the following trains in sequence as listed: Passenger train No. 175, The Colonial, leaving Boston at 9:00 a. m. and arriving at New Haven at 12:26 p. m., with five intermediate stops, returning on passenger train No. 14, the Bostonian, leaving New Haven at 1:30 p. m., one hour and four minutes after arrival at New Haven with train No. 175, and arrives at Boston at 4:45 p. m., with five intermediate stops. This double unit then runs to the outbound Boston freight yard and couples to a symbol freight train, designated BG-3, leaving Boston at 6:15 p. m. and arriving at Cedar Hill at 11:35 p. m. It returns on symbol freight train NE-2 leaving New Haven at 12:45 a. m., due to arrive at Boston at 6:10 a. m. where this unit lays over for servicing and again starts out on symbol freight train BH-1, The Cannonball, leaving Boston freight yard at 5:45 p. m., due at New Haven at 10:50 p. m. It leaves New Haven again on symbol freight train HB-4, leaving Cedar Hill yard at 11:30 p. m., due at Boston at 7:15 a. m. where it turns to passenger train No. 11, The Park Avenue, leaving Boston at 10:00 a. m. and arriving at New Haven at 1:10 p. m. It then returns on passenger train No. 22, The Yankee Clipper, leaving New Haven at 2:25 p. m. and arriving at Boston at 5:30 p. m. It then runs to the outbound Boston freight yard and starts out in freight

(*Continued on page 216*)



The principal controls at the operator's station

Chesapeake & Ohio Coaches

Seats for 80 are provided in two compartments — The cars were built by the American Car and Foundry Company of carbon steel, largely by riveting— The structures include unusual protection against telescoping under collision impacts — Weight, 139,660 lb.

The Chesapeake & Ohio is receiving delivery from the American Car and Foundry Company of twenty double vestibule coaches which are notable for their simplicity of interior design. Each car accommodates 80 passengers in double rotating, reclining seats.

The cars are of modern design, to the present A. A. R. standard contour for new passenger cars, but without skirts. They have a coupled length of 80 ft. 5¾ in.; length center to center of trucks, 55 ft. 11 in.; height rail to top of roof, 13 ft. 6 in., and width over side sills, 10 ft. The light weight of the car body is 91.840 lb.: the two six-wheel trucks, 47,820 lb.—a total of 139,660 lb. Toilet facilities for men and women are located at each end of the car, and the cars are partitioned to form a smoking room, or Jim Crow section, at one end, with a seating capacity of 20 passengers, while the main passenger compartment seats 60.

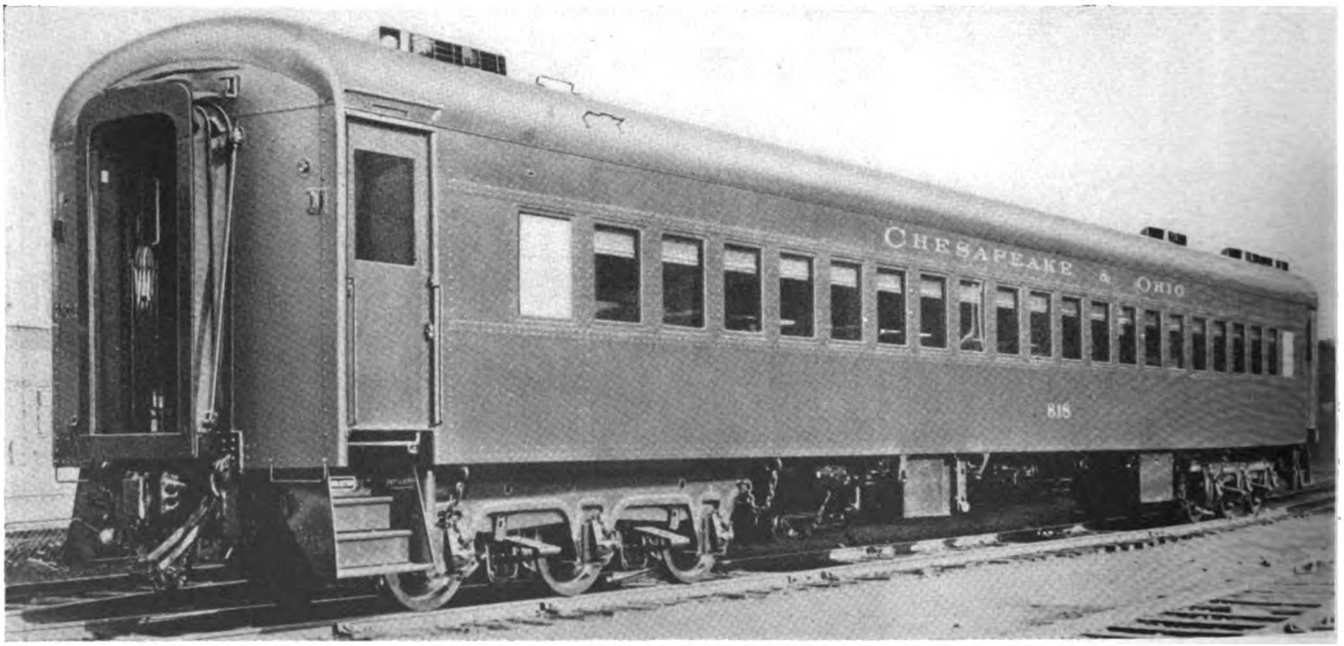
The Car Structure

The car structure is designed to meet the requirements of the U. S. Post Office Department's construction specification and the A. A. R. specification for the construction of new passenger equipment cars dated March 24, 1939. The first car shell was subjected to the A. A. R. squeeze test at Altoona, Pa., with very good results.

The car frame is of riveted and welded girder design and is built of ordinary openhearth carbon steel. The center sill comprises two A. A. R. Z-26 sections weighing 36.2 lb. per foot. They are spaced 16 in. between webs, with a ⅜-in. bar welded continuously to the upper inner flanges, and angle reinforcements at the bottom. The draft sills are a continuation of the center sills and are attached to the steel buffer castings. The side sills are 5-in. by 3-in. by 5⁄16-in. angles, and the side plates are 3-in., 6.7-lb. Z-bars. The sheathing is of No. 11 gauge steel and the roof sheets No 14 gauge steel. The side posts are pressed channel shape and the carlines are pressed Z shape. Unusual protection against telescoping in the event of collision is obtained by the extension of the vestibule I-beam end posts downward through the steel buffer casting to a distance of 22 in. above the rail. Another exceptional measure for the protection of the car against the effects of heavy end blows is the horizontal girder which extends across the car at side-plate height from the vestibule end posts to a line 8 ft. 3 in. inside the body of the car.

The underframe is covered with No. 18 gauge galvanized sheets. The car floor is laid on seven longitudinal wood stringers. It consists of ⅝-in. Keystone galvanized steel, covered with Tuco Flexolith. Insulation is 2 in. thick in the sides, ends, roof, and floor of the car. Ten cars have Stonefelt insulation, Type M., and ten cars Fiberglas insulation.

Miner A-5-XB friction draft gears and B-10-X buffing



C. & O. Coach built by the American Car and Foundry Company

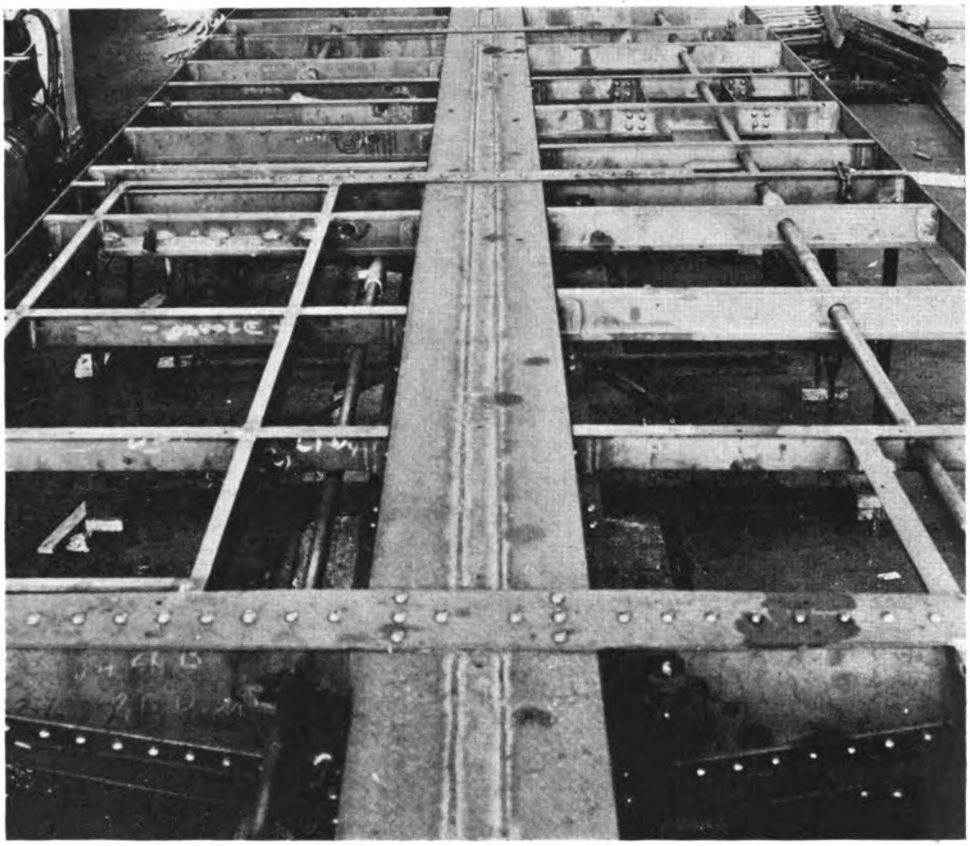
devices are applied, with Buckeye Type E couplers and A. S. F. cast-steel yokes. The coupler carrier and centering device was designed by the car builder and is supported by the main vestibule post extensions. It provides for limited lateral movement of train-line pipes. The face plate and buffer angle are supported by anti-rattling rods with the Fowler upper buffing device. Tuco National type trap doors are used over steel steps with Kass treads. Adams & Westlake vestibule curtains and two-fold U-shaped sectional diaphragms are at each end.

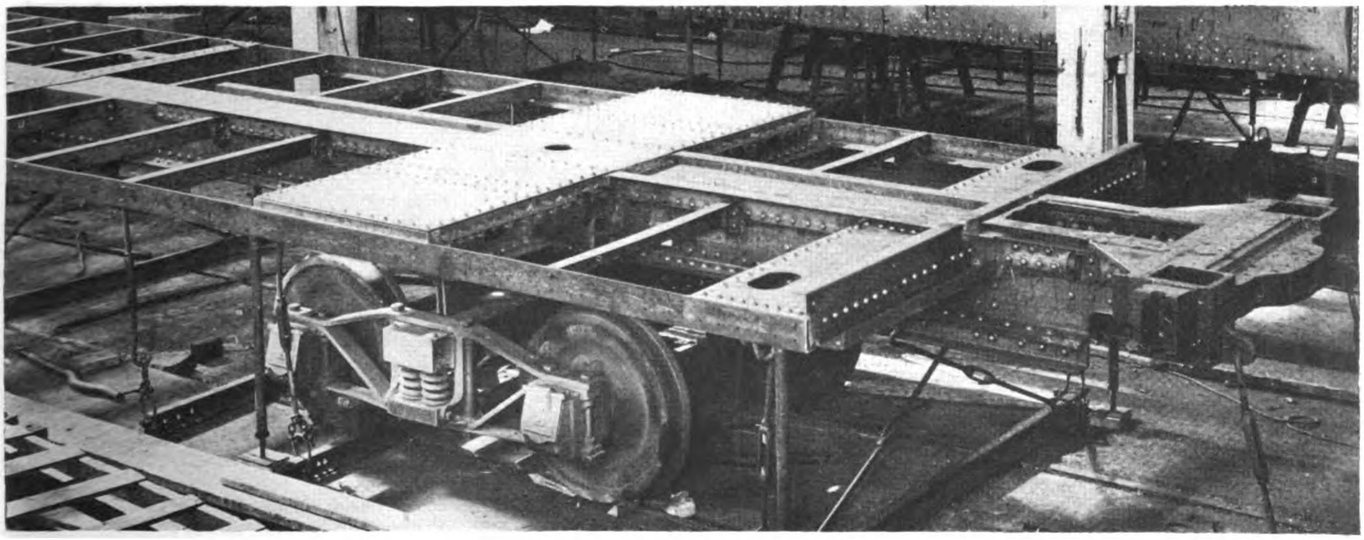
Interior Treatment

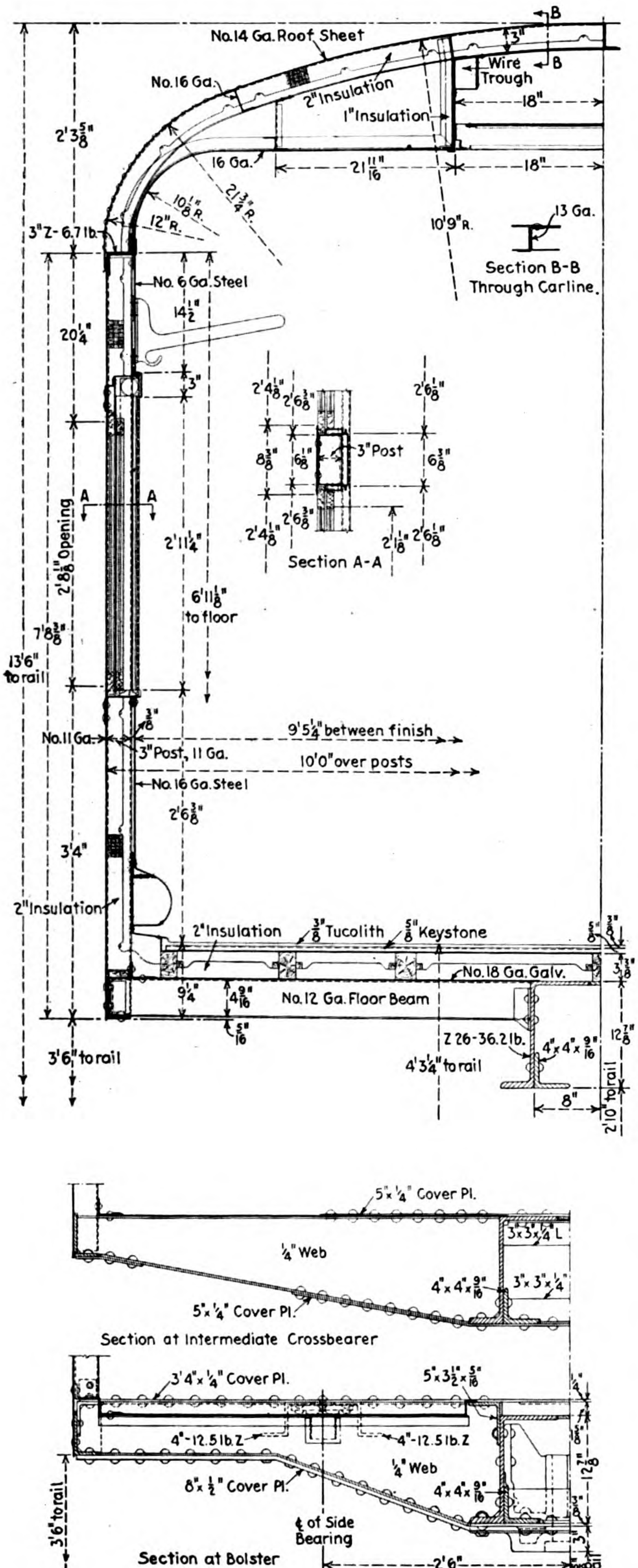
Simplicity of design and decorative treatment characterizes the steel interior finish. The bulkhead and swing door in the main passenger compartment are glazed in the upper panels. All exterior and interior doors are of steel. Window sash throughout the car are of mahogany, double, except at the toilets which are single. The outside sash are stationary and are thoroughly sealed. The inside sash are arranged to swing, being hinged vertically at one edge. The lower part of the toilet-room walls to a height of 28 in. from the floor are covered with Tylac $\frac{3}{16}$-in. imitation tile, $4\frac{1}{4}$-in. squares, in white with forest green scored lines.

The interior paint colors for the main compartment are various shades of Dulux gray. The entire ceiling in the main body of the car is light gray. Side walls from the side-plate moulding to the window capping are medium gray green. Window capping, basket racks, and bulkheads are medium gray green. Passageway walls and ceiling are also gray green. The side walls of the toilets above the tile wainscot are medium gray green.

Right: A general view of the underframe — Below: One end of the underframe showing the buffer casting and the end-sill and bolster construction







Sections through the car body and underframe

Vestibule walls and ceilings are painted dark green the same as the exterior of the car. All trimmings within the car are statuary-bronze finish.

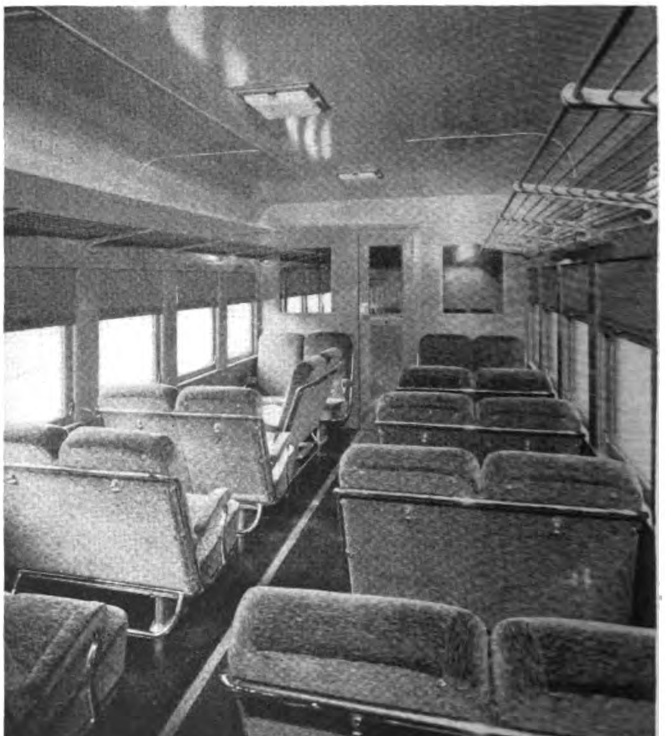
The tubular-frame seats are double rotating with reclining backs. The cushions are foam-rubber and the upholstery Massachusetts mohair plush. Ten car sets, furnished by the Heywood-Wakefield Company, are upholstered in two-tone brown, and ten car sets, furnished

The horizontal anti-collision girder extends inside the car one window beyond the toilets

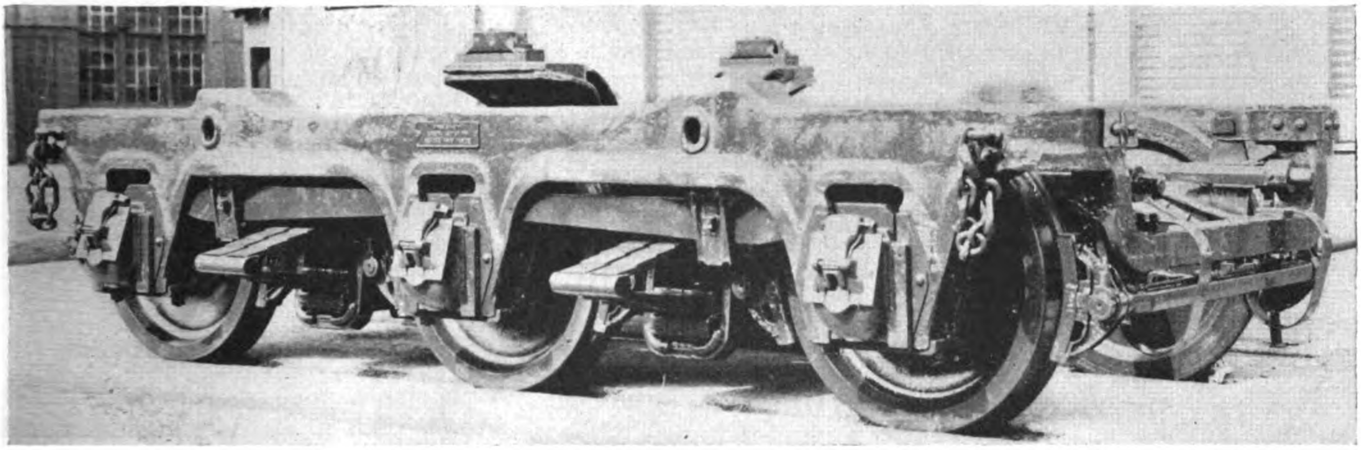
by the Coach & Car Equipment Company, are upholstered in two-tone rust.

The main floor has an aisle strip 18 in. wide, of ¼-in. Goodyear green mottle rubber, adged on each side with a 2-in. mottled cream strip. Toilet floors are covered with mottled cream rubber and the vestibule platforms with mottled green rubber.

Window curtains are silk-faced Pantasote material. The gray background is relieved with a small design in gold. The Adams & Westlake basket racks are 18 in. wide, of the continuous sectional type. Dayton monel-metal washstands and Duner single-pan flushing hoppers are used. The usual toilet-room accessories, such as clean- and used-towel cabinets, comb-and-brush



In the main passenger compartment, looking toward the smoking-room partition

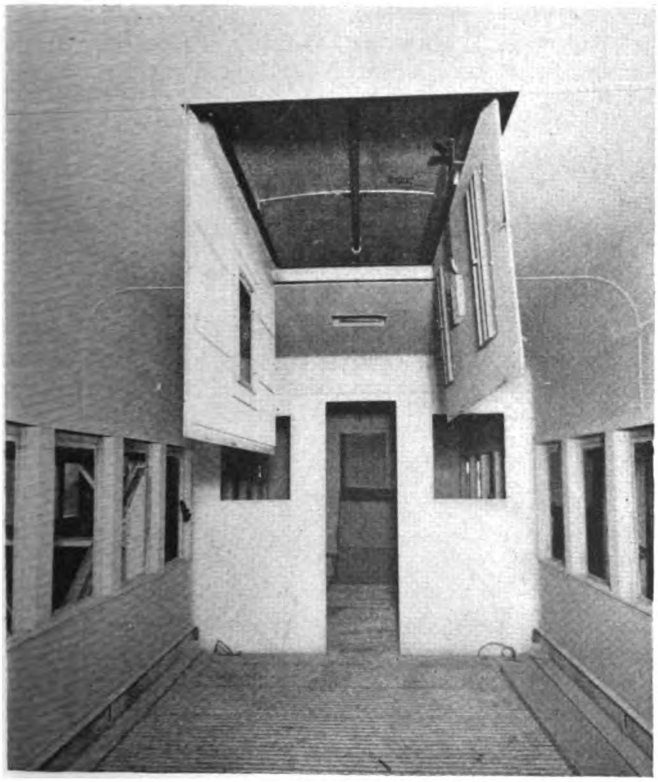


Straight-equalizer truck with inside side bearings for the C. & O. coaches

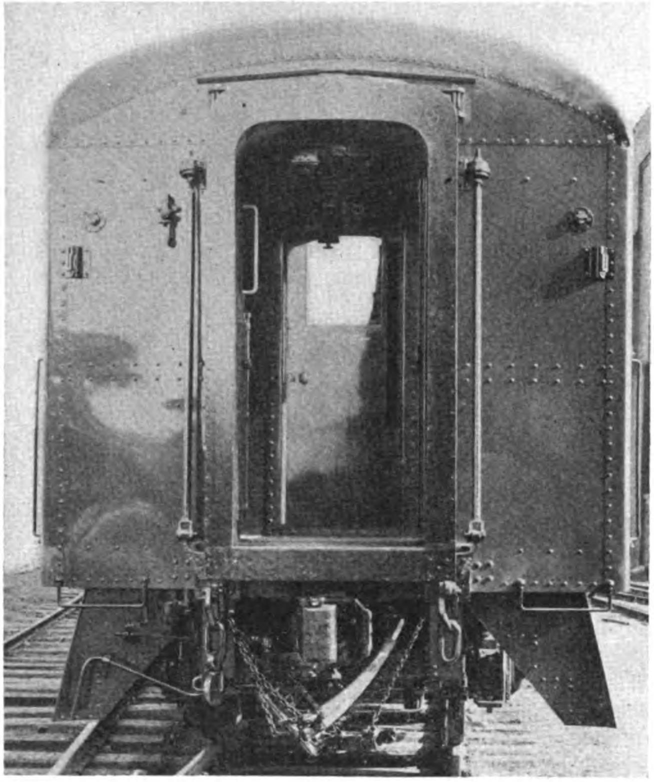
racks, coat hooks, and toilet-paper holders are provided. A mirror 18 in. by 30 in., is mounted in a frame over the washstand in each toilet room.

Lighting Equipment

The lighting equipment consists of a Safety body-suspended 4-kw. generator with Dayton V-belt drive. Storage batteries are supplied in equal numbers by four companies—the Electric Storage Battery Company, the K. W. Battery Company, the Gould Storage Battery Corporation, and the Philco Corporation, Storage Battery Division. There are nine Safety center lighting fixtures in the passenger compartments. These are square with opalescent glass reflectors and are recessed into the Multi-Vent center ceiling panels. A passageway ceiling fixture is located at each end of the car to match the center fixtures. Bracket lamps are placed above each washstand and vestibule ceiling fixtures are located over each step entrance.



A Multi-vent ceiling panel (left) and air-control panel (right) dropped, showing the interior of the air duct



The lower ends of the vestibule end posts extend well below the buffer casting

Air Conditioning

The air-conditioning equipment consists of the Waukesha seven-ton ice engine, with the necessary fuel tanks located beneath the car floor, and the standard overhead evaporator unit of the car builder, arranged for both cooling and heating, located over the toilets at one end of the car. Conditioned air is delivered to outlets in the Multi-Vent ceiling panels. Vapor control equipment is installed for cooling and heating. The floor heat is Vapor steam heat, including copper unit-fin-type radiation with thermostatic control. Vapor steam-heat couplers and flexible metallic conduit are used with 2-in. Gold valves. The steam train line is 2 in. extra-heavy wrought iron and Wovenstone insulation is applied over all steam pipes and fittings underneath the car. Four Garland exhaust-type roof ventilators with Auer registers are installed in each smoking compartment. There is also one over each toilet

room and one at the switch locker. Heater-pipe guards are curved and continuous, terminating approximately 1½ in. above the floor, with perforations in the vertical face only. They are applied high enough to facilitate cleaning underneath.

Air brakes are New York schedule UC-1-18 type. Blackall drop-handle hand brakes are applied in each vestibule with Peacock hand-brake boosters. The trucks are the General Steel Castings six-wheel straight-equalizer type, having inside side bearings. The wheel base is 11 ft. The axles have 5-in. by 9-in. journals, which are fitted with standard A. A. R. journal bearings. Journal boxes are the National Malleable & Steel Castings Company's cast-steel pedestal type with malleable-iron lids. The Armco multi-wear wrought-steel wheels are 36 in. in diameter. The treads were ground after the wheels were mounted on the axles. The truck center pins are of the Miner locking type and Stucki roller side bearings are used. The truck clasp brakes are the A. S. F. Simplex type.

New Haven 2000-Hp. Locomotives

(*Continued from page 211*)

service on symbol freight train BO-1, leaving Boston at 6:45 p. m. and arriving at Cedar Hill at 12:20 a. m., turning at New Haven to passenger train No. 4, the Narragansett, leaving New Haven at 3:00 a. m., due at Boston at 6:50 a. m. This unit then turns to the original cycle on train No. 175.

Likewise units D and E, and F and G, follow the same cycle. This is the normal assignment of the pool as a whole. By rotation one set of two units will be serviced at Boston each day.

While the schedules of the trains handled by the new locomotives were not revised with the introduction of the latter, performance of the schedules has been greatly improved. Officers of the road point out that regardless of the extremely short turn-around time allowed for the units, *no relief power is provided at terminals.*

Hence, all operating personnel know that schedules must be maintained or else a later train in the other direction is likely to lack a locomotive. There is no excuse for delaying a new Diesel. Dispatchers and yardmasters are expected to perform, and mechanical forces, as well, are faced with short servicing periods and can't "pray over" the new units all day. As far as the new locomotives themselves are concerned, turn-around time could be shortened even further if it were not necessary to run around the test train-control loops at each terminal.

The passenger trains which the Diesels haul are all heavy through runs between Boston and New York or Washington, D. C., and comprise as high as sixteen Pullman, coach and head-end cars. Steam locomotives on the New Haven-Boston run take water from a spout at the Providence station on a sharp curve which necessitates enginemen pulling in very slowly and "inching her to the faucet." The new locomotives permit a quick, smooth stop and show greatly increased acceleration out of the station.

In freight service the new locomotives are hauling the "hot-shots" of the railroad, all of which are timed for close connections with other railroads. While operating schedules have not been modified, the Diesels eliminate a regular coal and water stop at Midway (near New London) and have substantially reduced actual running time. This improvement is due in part to the ability of the Diesel-electric to accelerate faster than steam locomotives at slow and moderate speeds. The New Haven's "Shore Line" is characterized by numerous long curves and draw bridges which require constant speed reductions. The Diesel-electrics' quick "pick-up" helps to overcome this operating handicap.

C. & O. 2-6-6-6 Locomotives

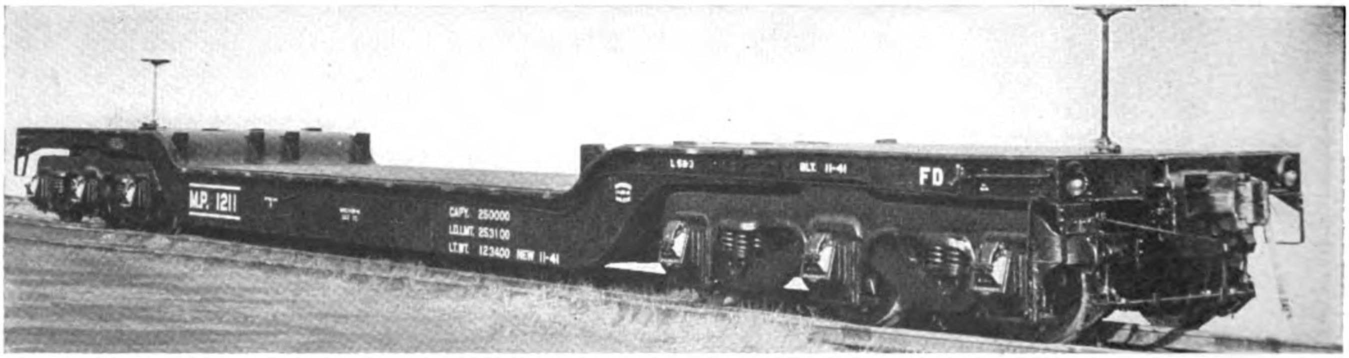
(*Continued from page 206*)

by Magnus. The trucks are equipped with A. S. F. clasp brakes with a braking ratio of 70 per cent of the light weight at 50 lb. brake cylinder pressure. The brake rigging is designed for 100 lb. cylinder pressure.

The tank plates were supplied by Carnegie-Illinois and Republic Steel; the truck axles by Carnegie-Illinois and the tender-truck wheel by Armco. The tender draft gear is Miner A-22-XB with Buckeye Type E couplers and yokes. Cardwell-Westinghouse snubber springs are used on all trucks.

A 76-YEAR OLD LOCOMOTIVE is still in service on the British London Midland & Scottish. Old No. 20002 is probably the oldest tender locomotive (there are older engines of the tank type) in service in Great Britain. The locomotive has two fellows of the same class, but one year her junior, which are also still in service.

* * *



Missouri Pacific depressed-center flat car by the American Car and Foundry Company

This car, built in 1941, has a one-piece cast-steel underframe and six-wheel equalized trucks with 6½-in. by 12-in. journals and 30-in. rolled-steel multiple-wear wheels. Truck centers are at 44 ft. and the length over the coupler pulling faces is 61 ft. 4 in. Width: Maximum, 8 ft. 10¾ in.; at well, 7 ft. 8 in.

EDITORIALS

Billion Dollars A Month

Secretary of the Treasury Morgenthau has pointed out that the sales of Defense Bonds during the period May, 1941, through March, 1942, amounted to $4,860,000,000, or an average of approximately $440,000,000 a month. A goal of twelve billion dollars has been set for the sale of United States Savings Bonds, Series E, F and G, for the twelve-months' period beginning July 1. This will be slightly more than 10 per cent of our estimated national income during this period. It requires, also, that the American public shall buy bonds at a rate two and a half times the accomplishment of the past year. The Treasury Department has found that the "most effective single method for promoting the systematic purchase of the United States Savings Bonds is through the payroll savings plan." Almost fifty thousand firms, employing a total of roughly twenty million people, have made such plans available to their employees. The problem now, in the interest of winning the war and doing what we can to check inflation, is to speed up the campaign, with the objective of securing an average purchase of bonds equal to 10 per cent of the gross payroll. As Mr. Morgenthau frankly states, "the ever-increasing demands of our war machine create an urgency that we cannot escape or evade."

A Grave Risk Too Blithely Assumed

The prospects for adequate transportation to insure the full attainment of the nation's war objectives received a most discouraging set-back early in April. On April 4 the War Production Board took control of the production and delivery of cars and locomotives. Deliveries on orders then in process or to be built later are to be made only as directed, and they may be allocated to roads other than those who placed the orders. Then, on April 8, announcement was made that materials would be allocated during the remainder of 1942 for the production of only 18,000 freight cars and 300 locomotives in addition to the cars and locomotives for which provision was made by the former Supply Priorities and Allocations Board on January 2 in schedules running until May 1. The railroads will thus be limited to approximately 63,000 new freight cars and 1,226 new locomotives during 1942. The number of locomotives does not fall far below the general expectations, but the curtailment in the number of new freight cars in prospect is decidedly disturbing.

Several estimates have been made as to the number of new freight cars required to meet the needs of the railroads for the increasing volume of freight transportation which they must produce. In a study of the freight-car situation published in the Annual Statistical Number of the Railway Age at the beginning of the year, an increase in ownership between October 1, 1941, and October 1, 1942, of at least 90,000 cars—preferably of 140,000 cars—was suggested. In the railroads' estimate of steel requirements for 1942, which were compiled at the request of WPB during January, provision was made for 121,827 freight cars. Including the carryover of orders undelivered on January 1, orders were on hand at the end of March calling for the building of about 94,500 freight cars.

No one has ever accused the railroads of being over liberal in the estimates of their needs for new equipment, and the orders awaiting delivery on March 31 may be considered a measure of the conservative judgment of the railroads relative to their needs at that time. The War Production Board's plan represents a deficiency below this number of 31,500 cars.

Until 1939 and again last year the performance during the four highest weeks of the fall peak in 1929 represented the most intensive utilization of freight cars of which clear records are available. In 1939, there were 1.62 active cars per weekly car load; in 1929, 1.67. The number of cars on line per weekly car load in 1939 was considerably higher than in 1929. Last year, these conditions were just reversed. There were 1.81 cars on line per weekly car load as compared with 1.88 in 1929, but the 1.69 active cars per weekly car load were slightly higher than the 1929 figure. The point at issue is whether the utilization represented by the lowest of these ratios will be greatly exceeded.

There are several factors which must be considered in any attempt to answer this question: first there is the resiliency of the railways to meet difficult situations, a quite indeterminate factor; second is the cooperation between shippers and the railroads to cut down idle car days and to increase the average car load and General Order No. 1 of the ODT to increase the tons per car of l. c. l. freight. These factors are both favorable to record-breaking car utilization.

The increase in average haul, however, is an unfavorable factor. During the third quarter of 1941 each car load averaged 29.7 tons—2.3 tons more than during the third quarter of 1929—and each revenue car load moved on the average about 390 miles, almost 28 per cent farther than during the same quarter of 1929. During January and February, 1942, each revenue car load carried an average of 29 tons, which compares with

27.6 tons during the first quarter of last year, and moved its load an estimated distance something over 60 miles farther than the approximate 390 miles averaged by cars loaded with revenue freight during the first quarter of last year. While the increased load conserves car capacity, the increased length of haul represents an appreciable addition to the time en route.

In using the carloading ratios of the four weeks with the highest loading in the fall as the basis for estimating car needs, consideration must be given as to the probable duration of peak traffic conditions. For many years a period of four weeks has adequately covered the peak condition, with carloading values definitely ascending and descending before and after this period. But last year the variation in the number of weekly carloadings was very small for eight weeks. And this fall carloadings may continue at peak levels even longer. This is a factor decidedly unfavorable to effecting a decrease in the ratio of cars on line to average weekly carloadings, because it is sure to cause some temporary increase in the number of bad-order cars. An accumulated reserve of physical car conditions which will go through a period of four weeks' intensive use without apparent strain will become threadbare in spots before the end of a similar two or three months' period.

The need for steel to build ships and other war equipment is very great. Indeed, if we had capacity to produce enough of it, our war production objectives might very well be set much higher than they now stand—the war might thereby be shortened. But in taking steel from the railroads in order that production of these essential war materials may be pushed up to otherwise impossible levels, a grave risk is being assumed that either the war program may be slowed down directly by lack of transportation, or that our civilian needs will be curtailed below the minimums now rapidly being established by rationing. And that, too, will result in a slowing down of our war-production program.

"Mines Above The Ground"

The importance of finding every bit of idle usable material and getting it back into useful service as an aid to the prosecution of the war is emphasized by the series of meetings which are being organized under the sponsorship of the Bureau of Industrial Conservation of the War Production Board. Such a meeting for the consideration of engineering aspects of the national industrial scrap salvage program was held in New York on April 28. Cooperating in organizing the meeting were the 24 engineering, technical, and industrial societies and associations with organized groups within that city.

The program dealt with the needs for and methods of reclaiming many types of materials.

In the matter of steel, particular stress was placed on the need for saving and reclaiming all alloy scrap. It was pointed out by Dr. Charles Herty of the Bethlehem Steel Company that the quantity of alloy steel that can be produced from a given amount of nickel can be increased about 40 per cent by adding the steel plant scrap to the new nickel, about 78 per cent by the further addition of normal commercial alloy scrap, and by about 150 per cent if the nickel alloy turnings can be reclaimed and put back to use.

These figures clearly indicate the tremendous importance of restoring alloy-steel scrap to useful service. To accomplish this, however, such scrap must be segregated, not only from carbon steel but into several classifications, depending upon the nature of the alloy. The urgent need for more of almost every element used in producing alloy steels than can possibly be furnished in the form of raw material calls for unusual care in preventing the loss of any of these valuable elements by segregating them at the source. The same thing applies in the case of non-ferrous metal scrap, but this probably needs but little emphasis on the railroads.

Speeding the Movement Of War Materials

Three circular letters recently issued by the Association of American Railroads, Mechanical Division, over the signature of Secretary A. C. Browning, deserve special emphasis because of their important bearing on the speedy movement of war materials and civilian goods as well.

The first of these letters was necessitated by the fact that important government materials continue to be loaded in cars which require shopping enroute on account of defective conditions, such as air brakes overdue for periodic cleaning, brake pipes broken on account of insufficient anchorage, excessive brake-pipe leakage, piston travel not in accordance with the standard requirements, journal boxes overdue for periodic packing, etc. The present is obviously no time to let up on the drive for proper inspection and conditioning of cars before loading so as to avoid the necessity of shopping such cars enroute and thus delaying the movement of materials. This applies in the case of government consignments and the delays are almost equally objectionable in the case of civilian goods.

Another vital requirement, second only to the provision of serviceable equipment for loading, is the safe and satisfactory securement of these loads, especially on open-top cars, so that they will safely move to destination in modern high-speed freight trains, which are not only handled over the road at high operating speeds but are subject to fast switching at yards and terminals. This subject, discussed in the second circular letter, needs further concentrated attention by railroads, some of which are not giving proper supervision to the loading and securing of loads on open-top cars. The refusal

to accept in interchange shipments not loaded strictly in accordance with the published loading rules of the A. A. R. Mechanical Division, would undoubtedly overcome this difficulty. A more satisfactory method is to police the situation at originating points, convince shippers of the need for strict adherence to the A. A. R. loading rules, and thus avoid any commodities being loaded in such a way that they cannot proceed safely to destination without adjustment and delay enroute.

In the third letter, attention is called to numerous reported cases of the loading of unfit cars at manufacturers' plants having government contracts where qualified railroad inspectors do not have a chance to check empty cars before being reloaded. As a result, cars loaded with war materials have had to be set out enroute for necessary repairs and the adjustment of loads, thus causing delay to vital commodities.

Apparently a considerable amount of military equipment is still being loaded at army camps, as well as industrial plants, where railroad inspectors are denied admittance. Advice from Washington regarding this matter is to the effect that until definite action has been taken by the War department, carrier employees, in order to enter a military post or station, must comply with the rules and regulations established by the commanding officers for such admission. This is also the case in connection with entering plants manufacturing military equipment where rules and regulations have been established by army authorities.

A number of carriers have already taken steps to correct this situation by providing identification cards for employees whose duties require entrance into military reservations, this card bearing the signature of the employee, his photograph and the card being countersigned by an authorized company officer. Obviously, this practice must be more widely and generally adopted if freight cars are to be properly inspected at military reservations and industrial plants having government contracts, and thus prevent the loading of bad-order cars at these points and also make sure that all loads are properly secured in accordance with the A. A. R. loading rules.

New Books

PRACTICAL ARC WELDING. *A text book by W. J. Chaffee. Published by Hobart Trade School, Inc., Troy, Ohio. 516 pages, illustrated. Bound in red fabrikoid. Price, $2.*

To assist in developing the trained welding personnel demanded by the sudden acceleration of welding activity due to the national defense program, this handbook of practical arc welding has been written to replace the former Hobart book on welding. Part I is devoted to general welding information—the growth of arc welding; where arc welding is used; manufacturing applications; available metals and alloys; discussion of joints and welds; electrodes and filler rods; strength of arc-welded joints; cost of arc welding; characteristics of the welding arc; welding symbols and their use; equipment for arc welding; development of welding personnel. Parts II and III are devoted to the series of arc-welding lessons offered in the Hobart Trade School. This group of lessons covers preliminary instructions; starting and manipulating the arc; common joints with bare electrodes; welding light gauge sheets with coated electrodes; welding with coated rods in all positions; pipe welding; welding cast iron; special tests; welding with the carbon arc; "long arc" method of welding copper, and specialized applications of arc welding. Parts IV and V contain a dictionary of welding terms and helpful tabular data for operators and designers.

CONTRIBUTIONS TO THE METALLURGY OF STEEL. *Booklets Nos. 1 to 5, inclusive. American Iron and Steel Institute, 350 Fifth avenue, New York. Nos. 1 to 4, 25 cents each; No. 5, 50 cents.*

The five booklets which constitute the series of Contributions to the Metallurgy of Steel are, respectively, on Possible Substitutes for Nickel Steels; Direct Consumption of Aluminum in the Steel Industry; Problems Involved in the Conservation of Manganese; Possible Substitutes for Zinc Coatings on Steel, and Possible Alternates for Nickel, Chromium and Chromium-Nickel Constructional Alloy Steels. The report contained in Booklet No. 1 on Possible Substitutes for Nickel Steels, issued in May, 1941, deals only with constructional steels containing not more than the following percentages of the given elements: chromium, 1.50; nickel, 5.25; molybdenum, 0.75; manganese, 2; silicon, 2, and vanadium, 0.20. Part II deals with Carburizing Steels and Part III with Thorough-Hardening Steels. Booklet No. 5—Possible Alternates for Nickel, Chromium and Chromium-Nickel Constructional Alloy Steels—was recently prepared at the request of O.P.M. It gives details of four completely new series of alloy steels designed by a group of metallurgists from technical committees of the Institute, the S.A.E., and from alloy manufacturing companies. They embrace a series of carbon-molybdenum steels, manganese-molybdenum steels, low chromium-molybdenum and low nickel-chromium-molybdenum steels. These possible alternates are confined to constructional alloy steels containing not more than the following percentages of the following elements: nickel, 5.25; chromium, 3.99; manganese, 2; silicon, 2.25; vanadium, 0.25, and molybdenum, 1. They do not embrace the following types of steel: low-alloy high-tensile steels which are furnished as flat rolled products and which require no heat treatment; stainless steels or irons such as the high chromium or chromium-nickel types; medium chromium (2 to 10 per cent chromium) steels which sometimes contain other elements and which are used to resist scaling at elevated temperatures; or any class of tool steel.

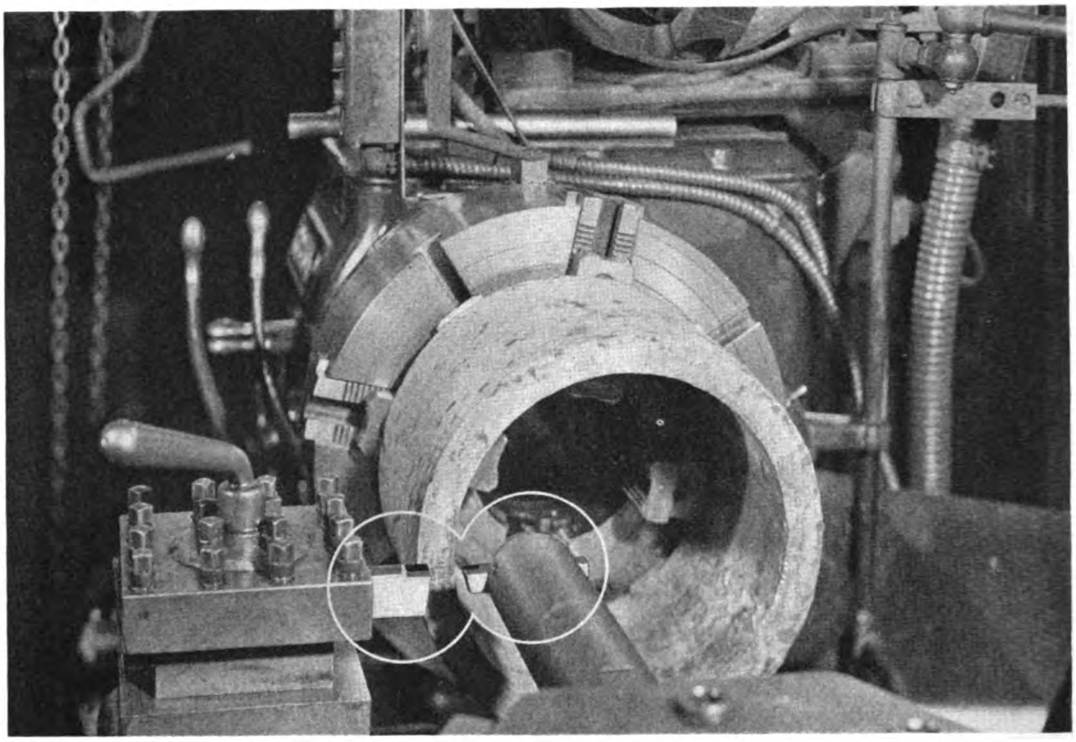


Fig. 1—Set-up of Firthite boring and turning tools in a horizontal turret lathe for machining rod brasses at 400 ft. per min.—As many as 500 bushings are finished between tool grinds

Sintered Carbide Tools on Railroad Machining Jobs

*By E. T. Broaddus**

In railroad shops, sintered carbide tools have usually been introduced first on brass and bronze work such as bushings, hub plates, and other wear parts. Such installations feature longer tool life, better finish, and closer tolerances. Many brass and bronze parts having rough, "sandy" surfaces and of abrasive composition can be machined without difficulty and without the usual rapid wear on tools formerly used.

Carbide tools can be used profitably on the older machines doing this class of work and present no problems where the higher speeds are not available. Fig. 1 shows a rod brass being machined at 350-400 ft. per min. with feeds (according to machine capacity) usually about $\frac{1}{4}$ in. to $\frac{1}{16}$ in. The tools run from a week to 30 days on each grinding, producing from 250 to 500 bushings before requiring resharpening.

Heavier brass and bronze machine work calls for heavier tools of sufficient hardness to withstand wear and at the same time toughness to withstand intermittent cuts. Two installations of this kind are illustrated in Figs. 2 and 3 which show the operations of machining bronze hub plates and crown or driving box brasses, respectively. An ingenious jig for holding the hub plate; shown in Fig. 2, greatly increases the machine production on this particular job. On the intermittent cut, shown in Fig. 3, the carbide tools maintain accurate bore and finish on this material which is usually tough or abrasive. Long tool life between grinds (60 to 75) is also secured.

Many special jobs on small brass parts that require extreme accuracy in shape and finish (such as valves, cocks, plugs and seats, triple-valve pistons, and many others) can be machined to advantage with carbide tools. The finish produced is such that grinding in with compound is often unnecessary; and tools stay sharp, enabling the operator to produce more work with a minimum of down-time for grinding.

On the many locomotive parts made of cast iron, Hunt-Spiller and other patented irons, it was early recognized

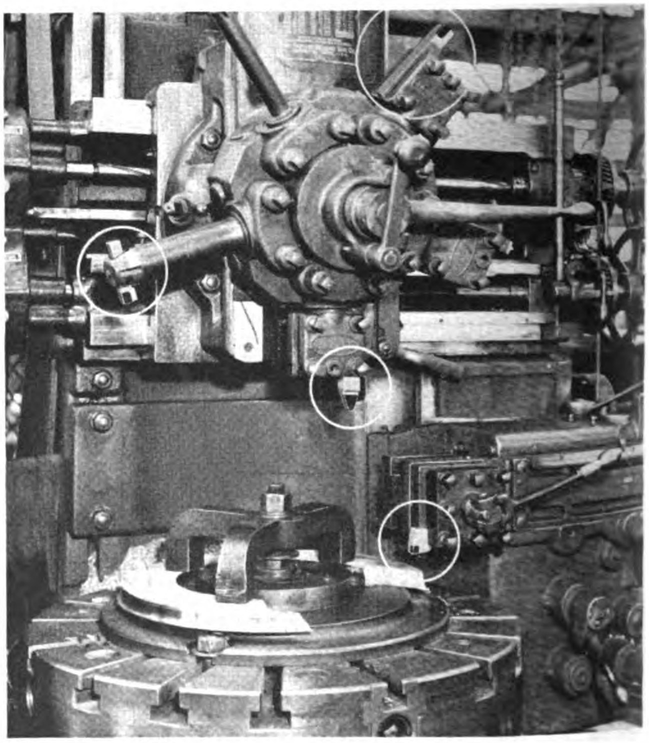


Fig. 2—Carbide-tool installation on a Bullard vertical turret lathe for machining driving-box hub plates—A special fixture is used for holding the work on the table

* Sales engineer, Firth-Sterling Steel Company.

that the use of carbide tools reduced the floor-to-floor time in machining such parts. On many machines, higher speeds could be used but in all cases better finish, greater accuracy of cut, minimum of tapering and, of course, longer tool life between grinds were realized—thus allowing the machine to be run more efficiently and turn out more and better work than by former methods.

This class of work includes cylinder bushings, valve bushings, rod bushings, piston bull-rings, valve bull-rings, pump cylinders, pump-cylinder bushings, hub plates, smoke stacks, and many other parts.

An installation of Firthite carbide tools on cylinder bushings uses three heavy tools for boring and turning. The surface cutting speed is 65 ft. per min.; feed 1/16 in.; average depth of cut 1/4 in.; pieces per tool grind, 25.

Fig. 4 shows Firthite tools machining piston bull rings —185 ft. per min. with .011 in. feed and 1/4 in. to 5/16 in. depth of cut; 25 pieces per tool grind. In reboring air compressor cylinders, as illustrated in Fig. 5, the tool, ground for a finish cut bores the cylinders in one pass holding to size and straightness without regrinding the tool for an average of 20 cylinders.

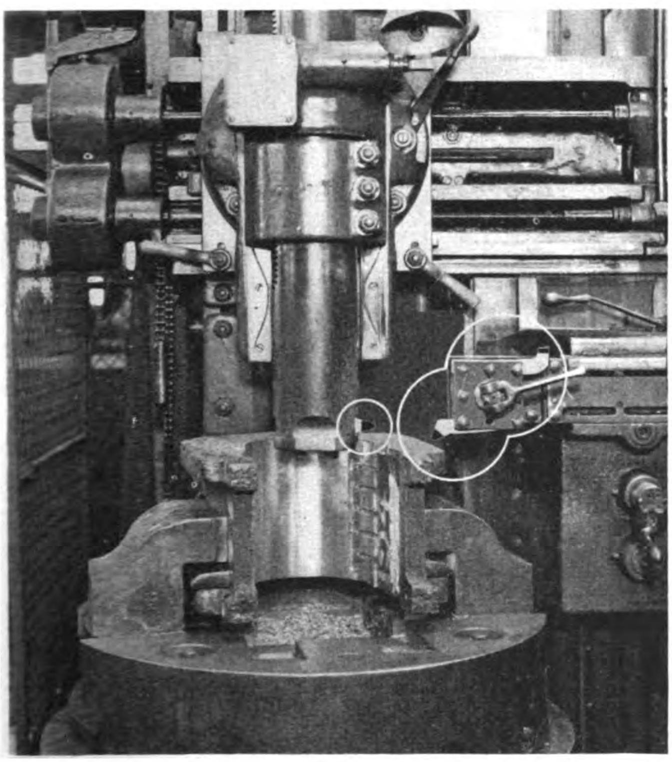


Fig. 3—Carbide tools used for boring a driving-box brass

Car Department Work

Car departments have many machining problems on which carbide tools are proving of great benefit where used in boring chilled cast-iron car wheels, finish machining car-axle journals previous to rolling, and machining car-journal brasses. An installation of carbide tools in boring bar where the cutting speed is 60 to 80 ft. per min., feed, 1/8 in. to 1/4 in. on roughing and 5/8 in. on finishing, is an example. Several hundred wheels are bored per grind of tools. Since wheels are bored to fit different size axles, tools can be depended upon to hold to size for micrometer adjustments over long periods. This is important for finishing to the close limits made necessary for press fits.

A tool of equal benefit to the car shop is used in finish-turning axle journals before rolling. Used in pairs of one right-hand and one left-hand tool, they will produce better machined, smoother surfaces requiring less subsequent rolling.

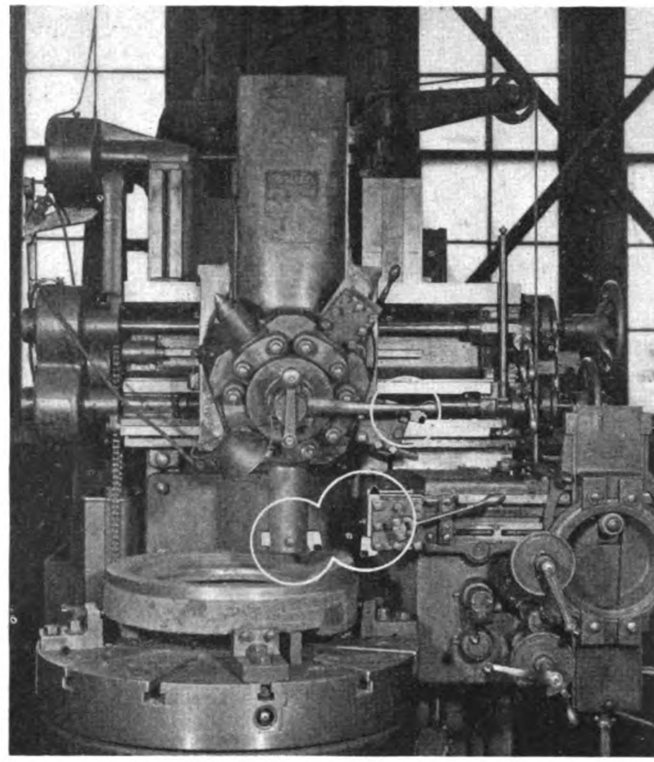


Fig. 4—In the finishing of piston bull rings the work is completed with the tools shown

Carbide Tools on Locomotive Parts

Locomotive parts frequently fail because of roughnesses and tool marks or checks on the finished part, which are often difficult to avoid with the ordinary cutting tools. Sintered carbide tools, such as Firthite, used in the machining of steel parts, can be operated at high speeds and fine feeds, producing machined surfaces of the highest quality and smoothest finish. To secure these results, it is important that the machine tools be either new or in good condition, with adequate power and speed range.

Several operations on which carbide tools have been successfully employed are: boring locomotive tires and machining driving axles, car axles, piston rods, link pins, trailer wheels, and bushings.

Carbide steel-cutting tools used for boring heat-treated

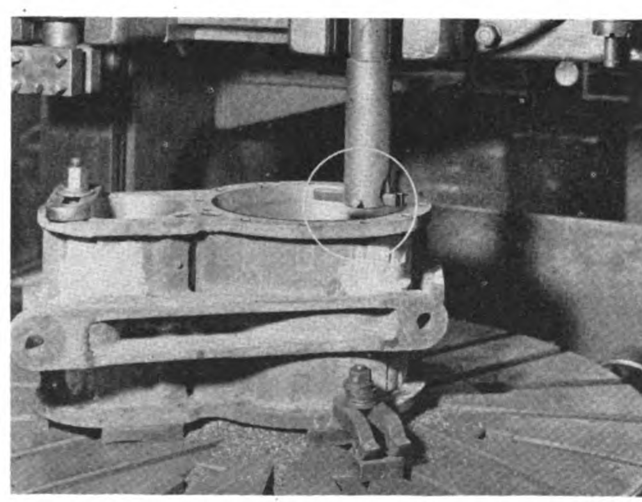


Fig. 5—Boring an air-compressor cylinder with a Firthite tool

locomotive tires on a 100-in. vertical mill at a speed of 120 to 130 ft. per min.; with a feed of .042 in. are able to turn out 12 to 14 tires a day. This compares with a production of six tires a day with previous tools. Another operation where steel-cutting carbide tools are used is the turning of driving axles. These are machined at 160 to 200 ft. per min. with .084 in. to .042 in. feed. About 1/32-in. stock is left for finish, which can be removed with one cut. This is an advantage over tools that require coarse feed and slower speed of work, often necessitating two cuts to get the desired finish to prepare the axle for burnishing.

Carbide tools are not a "cure-all" in the shop and are usually introduced on jobs where it is felt that the greatest benefits can be derived rather than on jobs where success is questionable. The handling of carbide tools satisfactorily necessitates proper instruction of machine operators in the fundamental requirements of each application. The co-operation of experienced carbide-tool engineers has proved valuable but it should be supplemented by the appointment of one or more men in the shop organization whose principal responsibility is the application of these new tools wherever they can be used to advantage. This plan is followed in large manufacturing plants, and, in railroad shops, can be made a part of the tool supervisor's activity and responsibilities.

An important factor in the successful use of carbide tools is proper grinding practice. Because of extreme hardness, cemented carbides cannot be ground on the same wheels used in sharpening other shop tools. Grinding is done with two types of wheels, either special silicon-carbide or diamond wheels. Grinding wheel recommendations for free-hand grinding with controlled table rest include: Roughing (straight or cup wheel) G-60-NW; 3,960/1—J+7, or 100-C-50 Diamond wheel. Finishing (cup wheel) G-100RW; 3,990/1-J7, or 320-C-50 Diamond.

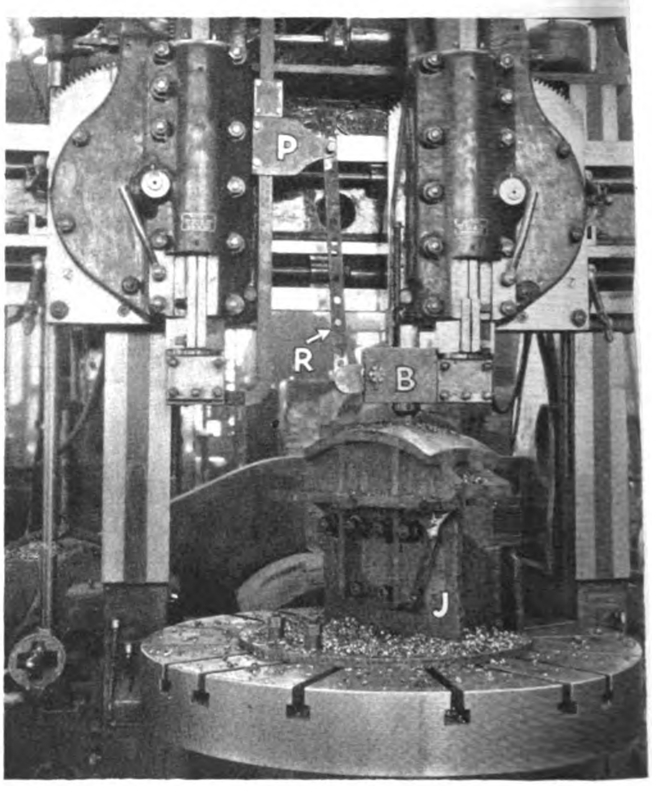
Accurate Machining Of Chafing Plates

An important feature of locomotive construction, particularly in relation to satisfactory operation on curves, is the drawbar and chafing-plate connection between locomotives and tenders. It seems obvious that the best results are secured when these chafing plates are accurately machined and well lubricated so as to offer a minimum resistance to sliding (with respect to each other) when locomotives and tenders are negotiating curved sections of track.

Referring to one of the illustrations, a Franklin stationary chafing plate, designed for application to the back end of a locomotive, is shown supported in a special jig which is bolted to the table of a Niles 52-in. boring mill, ready for machining the spherical surface which bears against one side of the floating chafing block, designed and applied so that the other side bears against the cylindrical surface of an adjustable chafing plate on the front of the tender.* The radius of the bearing surface of the stationary chafing plate is the same both ways and varies from 19⅞ in. to 37½ in., depending upon the class of locomotive. The governing factor in this radius is in reality the distance of the bearing surface from the drawbar-pin hole on the locomotive.

* For a suggested method of grinding the adjustable chafing plate see article on page 361 of September, 1941, *Railway Mechanical Engineer*.

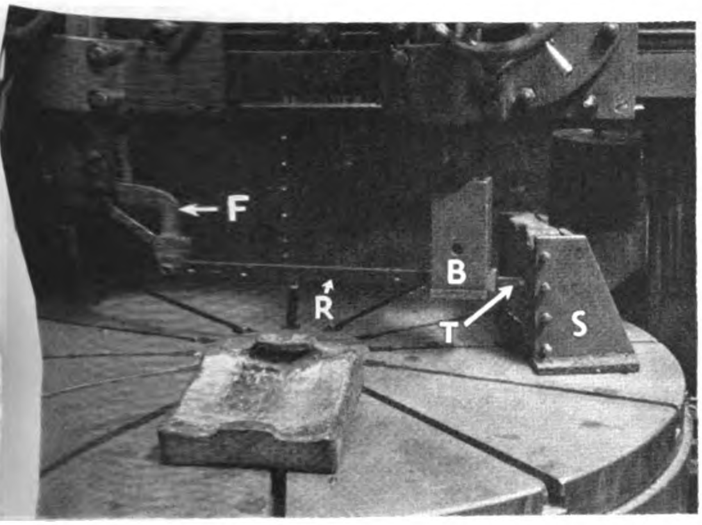
A study of the illustration shows that the stationary chafing plate is bolted to a welded-steel box-section jig, *J*, made of ⅞-in. boiler plate and mounted on a circular steel base plate which is bolted to the boring-mill table. The round-nose cutting tool is carried in a vertical sliding tool holder, *H*, guided in a heavy block, *B*, which is rigidly bolted to the lower part of the boring bar or ram carried in the right tool head. The cutting tool is moved up or down by means of lever connection from the radius bar, *R*, which is attached at the upper end to a fulcrum plate, *P*, bolted to the left tool head of the machine. The two heads of the machine are adjusted so as to bring the radius bar vertical when the cutting tool is at the highest point on the spherical surface of the chafing plate. With the work table rotating and horizontal feed applied to the right head, it is obvious that the round-nose cutting



Machining spherical bearing surface of Franklin stationary chafing plate with special jig on Niles 52-in. boring mill

tool will move vertically downward a small amount at first and then with greater speed, gradually forming a spherical surface of the correct radius, as determined by the length of the radius bar. The radius bar, itself, is made of ¾-in. by 1½-in. stock, drilled with holes to accommodate various lengths, as required. The fulcrum bracket is built up of 3-in. plates and carries a fulcrum pin, for connection to the radius bar. In machining the spherical bearing surface of Franklin stationary chafing plates, two cuts are usually taken in about one hour, with the setup shown.

Referring to the second illustration, the floating chafing block is set up in a special jib *S* on a Niles 84-in. boring mill, ready for machining the spherical bearing surface on one side. A finished floating plate is shown in the foreground on the boring-mill table. This method of machining floating blocks embodies the same principle as that previously described, but in this case the round-nose cutting tool, *T*, is supported in a sliding tool holder attached to the right end of the radius bar, *R*, and



Machining Franklin floating chafing blocks with the radius cutting tool on an 84-in. boring mill at the Albuquerque, N. M., locomotive shop of the Santa Fe

guided by block *B* at the lower end of the boring bar or ram in the right tool head of the machine. The construction of the light but rigid fulcrum bracket, *F*, bolted in the left boring bar tool holder, is clearly illustrated.

With the floating block secured by holding set screws in jig *S* and radius bar *B* set to the proper length, a spherical surface is formed on the floating plate when the work table is rotated and vertical feed given to the right tool head of the boring mill. Approximately one-half hour is required to set up and machine the spherical surface which forms one side of this floating block and fits accurately against the spherical surface of the stationary chafing plate on the locomotive. The reverse side of the floating block is machined to form a cylindrical surface simply by vertical feed of the right boring bar and cutting tool, without the radius attachment. This side of the floating block fits against the cylindrical surface of the adjustable chafing plate on the tender. In Santa Fe practice, when these floating chafing blocks become worn, they are brought back to standard size and shape by welding a layer of bronze on the worn surfaces and machining off excess metal by this method.

Boiler Patching Requires Care and Good Workmanship

By William N. Moore*

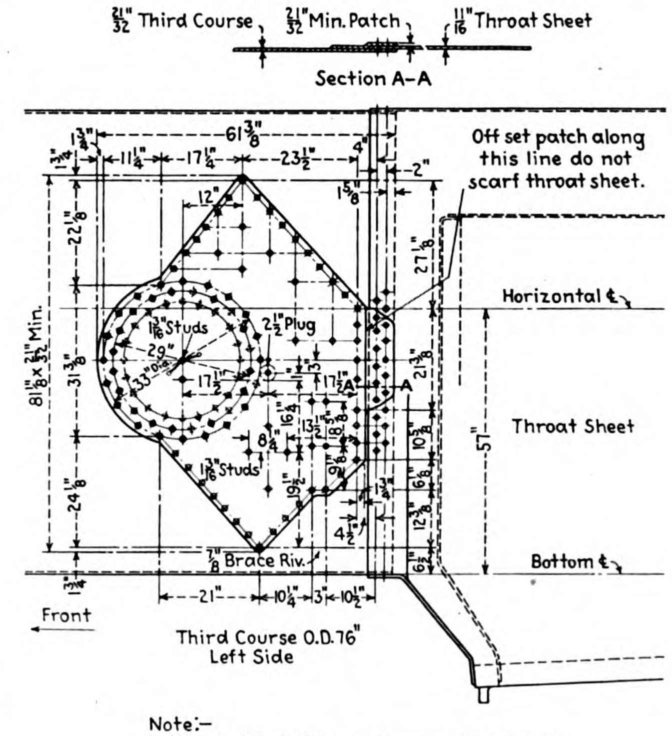
Prior to the enactment of the locomotive boiler inspection law of July 1, 1911, a patch on a boiler was just one man's job, the boilermaker's to whom the work was assigned. If he was a good boilermaker he was supposed to know enough to put on a patch and he worked only with the idea of "get her on" and "make her hold." Factor of safety, efficiency of seams, rivet size and spacing of plugs and patch bolts were of little concern so long as it held the caulking.

Today, however, the repairing and maintaining of boilers is a real problem and one that taxes the ingenuity of all concerned. Every move along the line must be made with precision. Making of the patch as designed by the engineering department, allowing for tapers, existing defects and previous patches, must be followed by equally good practice in application. Drilling, reaming of burrs from both sides of the plate, sanding new and old surfaces, cleaning off all foreign matter and fitting to gage are some of the practices which must be closely followed. Too many fit-up bolts cannot be used; one in every hole may be required in some patches. Riveting must be done with proper forming dies with proper pressures using rivets which have been heated to the correct temperature and which are not cold or burned.

For a job to be good it should also look good. Neatness is to be commended and encouraged.

The patch shown is not intended to illustrate an especially difficult application but it serves to show one of many types of situations which may confront a boilermaker. Cracks occurring in the third course of a boiler caused by the vibration of an air pump were covered and the shell reinforced by the application of the patch. The locomotive was a light passenger type carrying 190 lb. pressure in the boiler. The air pump was moved toward the front of the engine to eliminate the vibration which had caused the cracking.

After the removal of an older, smaller patch the one shown was formed and applied. The back portion of the new patch is offset by hot pressing to take care of the existing outside throat seam. The throat sheet was not scarfed. All holes were drilled and burrs on both sides of the sheet were removed. Riveting was done by double gunning using No. 90 hammers operating off an



Note:—
Outside patch applied at air pump bracket studs on account of crack indicated thus— and for reinforcement. Remove old patch.
Drill 3/8" holes in ends of crack.
Make patch of 21/32" minimum boiler steel flange quality
Use 1" steel rivets unless otherwise marked.
Make rivets of steel with holes 1/16" larger than rivet sizes given. All studs in region of patch. to be riveted over on inside of barrel.
Holes to be laid off from boiler.
New holes to be drilled.
Holes to be plugged in barrel of boiler girth. Dimensions taken on outside of third course stresses not changed.

Patch applied to third course of a boiler to reinforce cracked area resulting from air-pump vibration

* General boiler foreman, Pere Marquette, Grand Rapids, Mich.

air-line pressure of 120 lb. Rivets were heated with oil. Caulking operations were performed with hammers having 2-in. stroke using heavy and medium fullers. All rivets were caulked inside and out.

The water test made on the boiler was with 25 per cent excess pressure and under steam test the boiler was found to meet all requirements. After the patch had been applied the boiler was completely reinforced at check holes, washout holes and waist-sheet angles as insurance against future fractures.

Gisholt Saddle-Type Turret Lathes

Two new saddle-type turret lathes, known as the 3R and 4R, are shortly to be put into quantity production in the recently expanded and modernized Northern Works of the Gisholt Machine Company, Madison, Wis. Intended to meet the urgent wartime requirements for this type of machine tool, the new machines will be equivalent in most physical specifications to the Gisholt 3L and 4L turret lathes. In view of their design for large-scale production, however, the machines must be built on readily available machine tools and from materials obtained in the large quantities necessary. For this reason, also, these nearly identical machines will each be provided with the most commonly used tools and attachments.

General specifications for the machines are as follows: 3R—5¼-in. spindle bore; 21-in. chuck; 28½-in. swing over ways; 26-in. swing over carriage wing; 21½-in. swing over cross slide; 15-hp. driving motor. 4R—9¼-in. spindle bore; 24-in. chuck; 31-in. swing over ways; 27½-in. swing over carriage wing; 24½-in. swing over cross slide; 25-hp. driving motor.

Construction features will include a heavy semi-steel cast bed, well ribbed, with wide flat ways and undercut way for side carriage. A pressed-steel coolant pan with reservoir is provided between the bed and the cast-iron legs.

The headstock is a separate semi-steel casting accurately aligned with and securely bolted to the bed casting. Walls extend above all shafts so that bearings are seated in solid metal. All headstock shafts are mounted in anti-friction bearings. Four spindle speeds are provided through high-low multiple-disc clutch, jaw clutch, and semi-steel gears. Eight spindle speeds are available through a two-speed motor, and reverse spindle speeds by a reversing motor. A single lever starts and stops the spindle and selects the high or low multiple-disc clutch. A single lever operates the jaw clutch. All gears and bearings are splash lubricated.

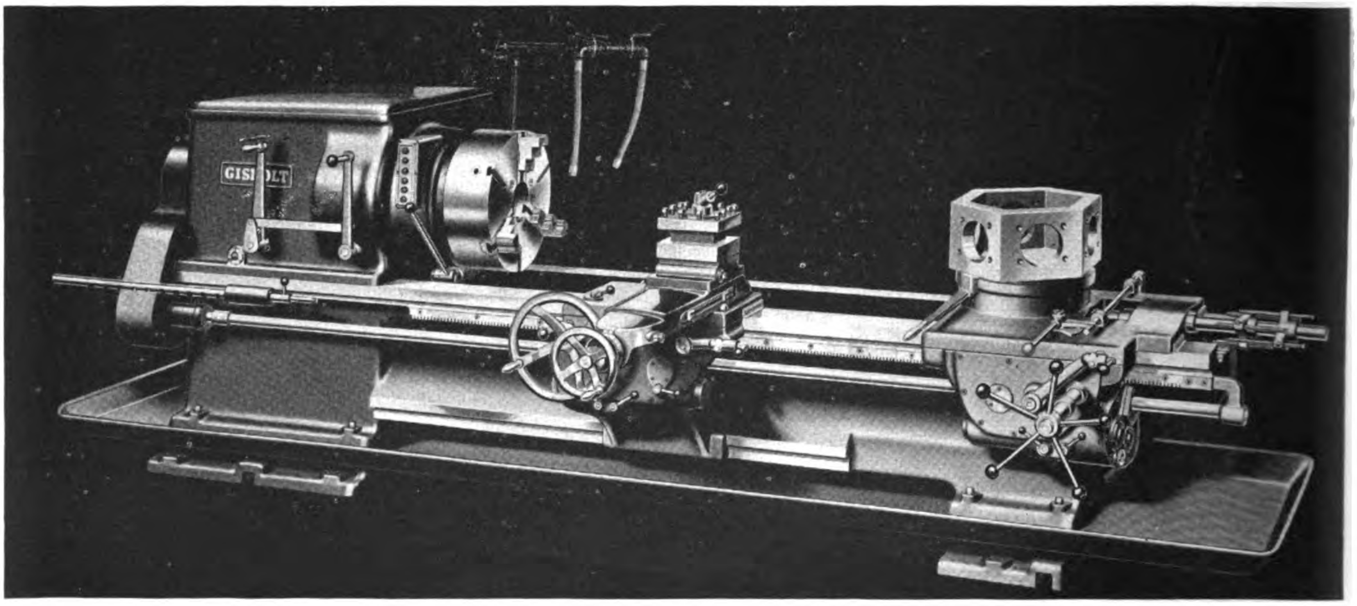
The heavy semi-steel eight-speed spindle has an American standard flanged-type spindle nose and is mounted in two double taper roller bearings, one at the front and one at the rear. No revolving gears are mounted on the spindle. A hand-operated brake operates on the flanged spindle nose.

The feed change gears are mounted on a quadrant in the feed gear train. The gears furnished provide for a range of fine and coarse feeds in addition to the middle standard range which is best suited to average requirements.

A side carriage of the full-swing type is mounted on the wide front way with square lock construction, and flat taper gibs give adjustment on both front and lower ways. The cross slide is mounted on a dovetail with taper gib for adjustment. The cross-feed screw has a micrometer dial. The box-type closed apron is supported by the lower undercut way. All shafts are mounted in anti-friction bearings. Four longitudinal feeds are available in one direction and four cross feeds in both directions. Cross feeds are one-half the longitudinal feeds. The longitudinal automatic feed trips by means of a six-position stop roll. The steel square-turret tool post, mounted on the cross slide, is locked by a powerful sleeve clamp and provided with an auxiliary side clamp. It is indexed by hand after releasing the clamps and raising the tool post from the indexing pin.

The turret carriage, of heavy bridge construction, is aligned by the front way and secured to the rear way with a square lock gib. A flat taper gib provides for adjustment on the front way. A box-type closed apron is used with shafts mounted in anti-friction bearings. Four longitudinal feeds are engaged through a friction clutch. Automatic feed trips are available for each face of the hexagonal turret, indexed with the turret.

The hexagonal turret is a hollow semi-steel casting

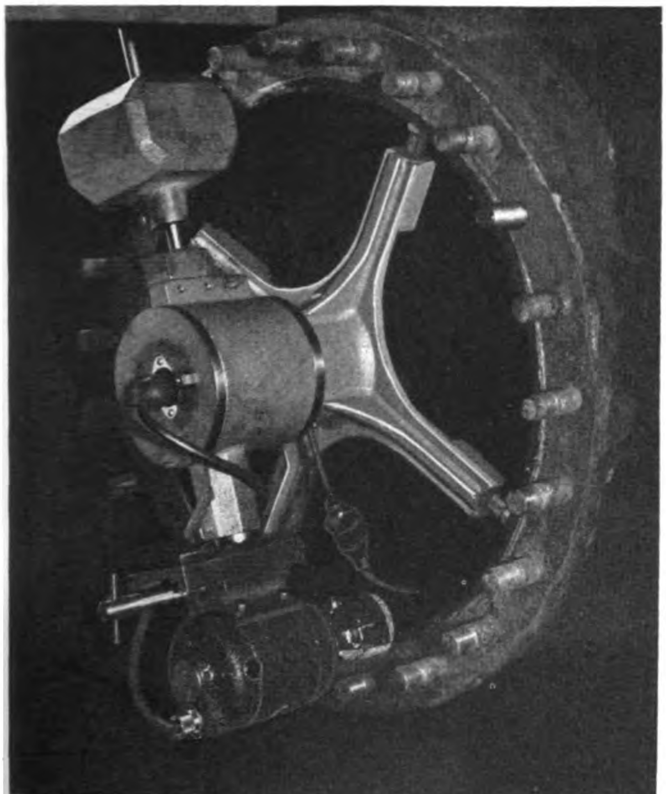


Gisholt saddle-type turret lathe, built in two sizes with 28½-in. and 31-in. swing, 5¼-in. and 9¼-in. bore

mounted on an anti-friction bearing on the turret carriage. An external double-bevel clamp ring has a toggle lock. The single lever at the front releases the clamp ring and withdraws the indexing pin. A full-length lead screw and taper attachment are optional. Standard tool equipment supplied includes 14 separate items and an extra bar tool set for the 3R machine is optional.

Cylinder Head Seat Grinder

A portable rotary surface grinding machine which trues and refinishes the cylinder-head seat on locomotive cylinders without the necessity of removing studs has been developed by the R. J. McQuade Company, Chicago, and is now being used with satisfactory results at a number of railroad shops. With the former method of mechanically or manually grinding the individual head to its own cylinder, tests at one shop indicated that an average of six man-hours per cylinder joint are required, whereas with the use of this machine, the operation is performed in an average on one man-hour per cylinder joint. The speed and ease with which the machine performs the operation is quite important, but the principal advantage is the accuracy and smoothness of the work since, with proper attention to the seat on the cylinder head, a steam-tight and trouble-free joint is assured on the first trial.



McQuade rotary surface grinder refinishing cylinder head seat without the necessity of removing studs

The machine is light and simple in construction. It is held in place in the cylinder by a four-point spider set near the edge of the cylinder bore and is equipped with pointed adjusting screws which are used to make the center line of the revolving balanced grinder arm coincide with the center line of the cylinder. A ½-hp. universal electric motor, with cup-type grinding wheel, is mounted on a cross-feed slide at the outer end of a rotating arm which telescopes the center housing and is adjustable in length for different cylinder diameters. Three extensions of different lengths are supplied to take care of the entire range of cylinder sizes. The cross-feed slide permits adjusting the grinding wheel to give a light or heavy cut on the cylinder joint, as desired. Grinding is accomplished with the cup-type grinding wheel which is 2½ in. in outside diameter, by 1 in. inside diameter, by 1½ in. long. The cup grinding surface is, therefore, 1½ in. wide. The grinding wheel has a leaded back ½ in. thick and is applied to the motor spindle between compression washers in the usual way.

In using this electric-driven machine, the grinding wheel is enabled to rotate about the center line of the cylinder by means of a slip-type plug-in mounted at the center of the spider. The grinding wheel, in its position on the balanced arm, will rotate itself about the circle when properly tilted, but experiencé at the shop mentioned indicates that best results are secured when the grinding wheel is slowly revolved by hand. The cylinder-head seat may be faced on a boring mill using a finishing tool with a carbide cutting tip which produces a highly-polished and evenly finished surface. A number of railroads, however, prefer a complete grinding job, in which case cylinder heads are chucked in a boring mill or engine lathe, and an electric-driven cup-grinder, similar to the one shown but arranged for mounting in the lathe tool post, is used to finish the cylinder-head seat accurately and smoothly.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Correction — Why Was the Smoke-box Damper Eliminated?

Q.—What is the reason for eliminating the damper in the smokebox of the modern locomotives?—M. R. K.

A.—The following corrections are made to the answer given in the March issue: The manufacturer's practice is to include the smokebox damper with all superheater equipment, when the throttle is located in the dome. When the front end throttle is installed, it is not required by reason of the fact that the units are protected at all times by steam.

This applies to any type of superheater when the front end throttle is used. It is quite true that dampers are left out in many locomotives and can be done successfully today with the forged return bend type superheater unit where welds and other forms of joints are not used in fabricating of the unit. However, the life of the unit without protection of the damper is still unprotected, as it is the material that is protected against overheating by application of the damper.

Correction — Three Ways to Cure A Leaking Throttle

Q.—We have equipped several Pacific type locomotives with multiple throttles and find that we have trouble with leaky throttles. What causes this condition? Is it due to the expansion of the boiler? Can this condition be remedied by increasing the length of the throttle rod when the engine is hot so that the pilot cam just clears the top collar of the pilot valve?—F. I. R.

A.—The first and third methods of correcting a leaky throttle as outlined in the March issue do not meet with the approval of the manufacturer; the second method, "the use of a compensating lever," is the manufacturer's recommended practice for overcoming leakage due to the valves lifting when the boiler expands.

In some earlier designs the compensating lever was not used, but the valves and cam shaft are designed with enough play between the lifting and pull down sections of the valve and cam to compensate for considerable expansion in the boiler without raising the valves, provided they are properly set when the boiler is cold.

Repairing Leaking Staybolts and Holes

Q.—We have considerable trouble with firebox side sheets, due to leaky staybolts and staybolt holes checking. Should the side sheets be renewed when these conditions are found? What can be done to overcome this condition?—J. F. D.

A.—An examination of the side sheets should be made to determine the extent of the checking of the staybolt holes. If a considerable area is involved, part side sheets should be applied to include the entire area affected. If this condition exists to any extent at general shopping it is advisable to renew the side sheets rather than risking the necessity of renewing the sheets between shoppings.

Leaky staybolts, due to enlarged holes or distorted threads, can be repaired by applying larger size staybolts or by reducing the size of the hole and retapping. This is done by either of two methods, depending largely upon the equipment available:

First—By closing up the holes by oxyacetylene welding. This is done by depositing metal from a 1/8-in. welding rod and then reaming and tapping the hole to the standard staybolt size. By the use of the proper welding rod metal can be deposited which is readily reamed and threaded.

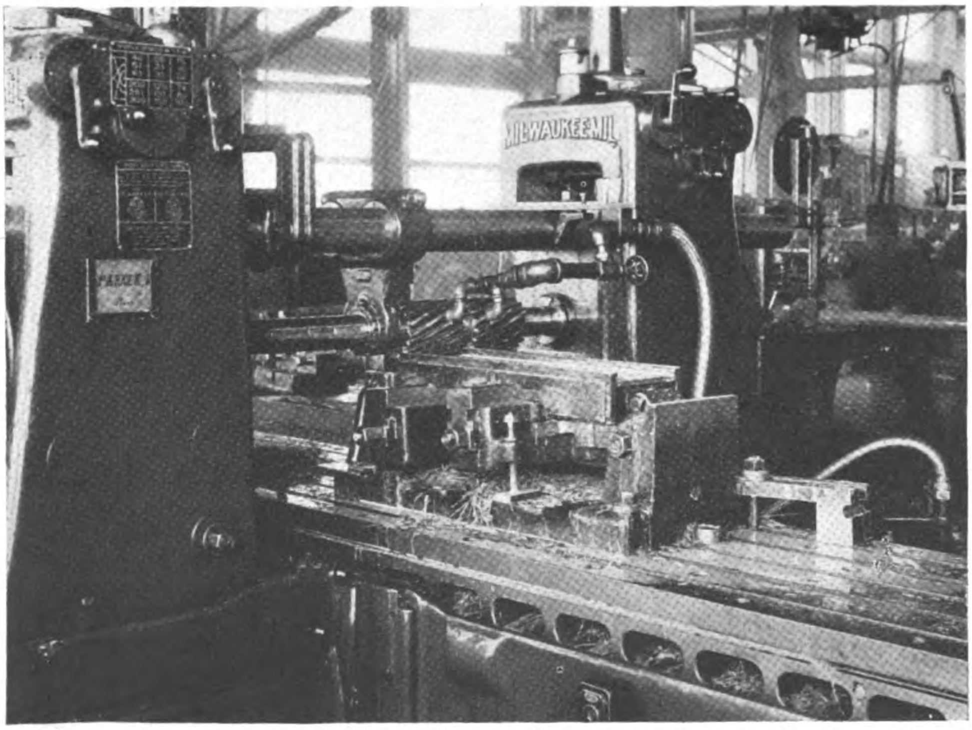
Second—By applying steel bushings. In applying steel bushings, the worn staybolt holes are reamed out considerable oversize. Steel sleeves are then inserted in the holes and welded in place, the sleeve having been previously tapped out for a standard staybolt. With this method of repair, the sleeve can readily be cut or driven out, should the staybolt hole in it become enlarged.

There are numerous causes for radial cracks developing from the staybolt holes, such as bad water conditions, improper firing, expansion and contraction of the sheets, and improper application of the staybolts.

Through any of these causes staybolts start leaking; they are then driven up, this continual working on the staybolts sets up strains in the sheets which, together with expansion and contraction, cause the sheets to crystalize and crack. Proper application of the staybolts would reduce this condition to a great extent. Holes in side sheets should be punched out and reamed before tapping.

Shoe and Wedge Milling Fixture

The illustration shows a holding fixture used to support driving-box shoes and wedges while being machined on a modern Milwaukee milling machine, installed at the Santa Fe shops, Albuquerque, N. M. The fixture, which is mounted on a 22-in. by 108-in. work table, grips the shoe, or wedge flanges sufficiently firmly to hold the work during any ordinary cut. Adjusting screws are used to level the shoe and hold it in accurate alinement for the milling machine cut. Five-inch solid high-speed steel cutters are used for the particular job, and the shoes and wedges are finished to size for the frame jaw to fit with one roughing and one finishing cut. The cutter speed is 21 r.p.m. and the feed about 1⅞ in. per min.



Milling machine and holding fixture used in machining shoes and wedges at the Santa Fe locomotive shops, Albuquerque, N. M.

Large-capacity armored rubber hose conducts an ample supply of coolant to the milling cutter to support maximum cutting speeds and feeds. On the left column of the machine is a sheet-metal holder designed to carry a card marked with the name of the man regularly assigned to operate the machine. The practice of applying individual name cards to machines in this shop has been found to produce good results, since the operators are thereby encouraged to take a personal interest in their respective machines, to keep the machines and surrounding premises clean and, above all, to see to it that the machines are always in good condition and adjustment.

Plastic Gasket and Pipe Thread Compound

An easily applied plastic gasket or pipe-thread compound with a wide range of applications is manufactured by National Engineering Products, Inc., Washington, D. C. Known by the trade name Copaltite this sealing agent has been used in many industrial, marine and boiler plants to seal joints of almost every type. Used as a plastic gasket, it resists pressures up to 6,500 lb. while on threaded joints it holds pressures to 10,000 lb. The temperature range of the material is from minus 315 deg. to plus 1,500 deg. F. and throughout this range it is unaffected by vibration, contraction or expansion. Copalite remains unaffected chemically or physically in lines carrying refrigerants, benzine, gasoline, salt brine, oils, greases, ammonia, alcohol, alkalis, gases and diluted acids.

Best results are achieved by the observation of a few simple rules in application either of the liquid sealer which is intended for use on smooth, highly machined surfaces and pipe threads, or the cementing compound used on rough surfaces, warped flanges or unfinished parts.

Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Boiler Check Carrier

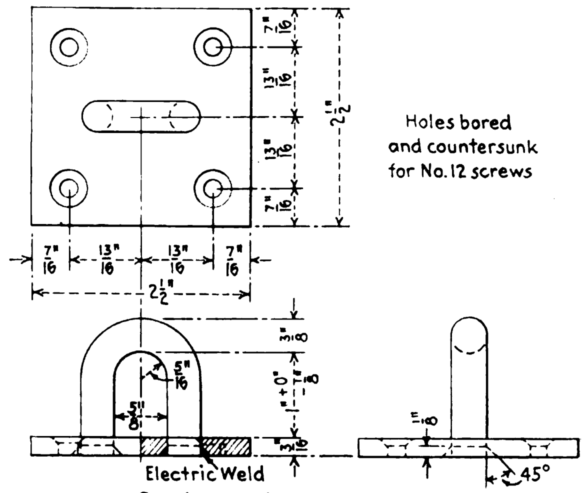
Q.—Can you suggest a welded carrier for boiler check reseating tools? We use three or four types of tools and it is not easy to carry all of them when climbing up onto the running board.

A.—Cut a piece of 3/16-in. tank steel about 4 in. wide so that it can be drilled to hold the check tools. The length should be sufficient to accommodate the number of tools to be carried, (about 18 in. for three and about 21 in. for four). A section four inches from each end should be bent at right angles to form legs. Make a handle of ¼ in. round iron and weld it on. If the center of the tool has a tendency to slide through the hole in the plate, make a short shelf of ⅛-in. plate and weld this directly underneath the tool.

Making Car Door Staples

Q.—For cars that use the old hasp and staple closing arrangement, it is sometimes difficult to secure the heavy staples. How can a substitute be made?

A.—The easiest way to make the staple would be to bend the round part of the staple around some sort of a jig. Use ⅜-in. round stock and make the opening about ⅝ in. by 1 in. A piece of 3/16-in. plate is cut 2½ in. square. This is drilled and countersunk for No. 12 screws. The 13/32-in. holes in the center that hold the staple are countersunk on the opposite side from the screw holes. The staple is forced into the plate with the ends of the staple flush with the bottom of the plate and held this way in a vise. A bead of weld is placed around each staple end in the countersunk provided for it. This should make a rugged staple and no finishing will be needed on the back side.



Car door staple made by welding

Removing Grease Spots From Floors

Q.—I have heard that grease spots could be removed with the welding torch. Is this possible, and how is it accomplished?

A.—Grease spots can be removed from car floors with a welding torch. Before starting all dust and dirt is swept from the area to be heated. A pail of water is placed near by in case it is needed. A welding torch with a medium welding head is lighted and adjusted to an excessive acetylene flame. The flame is brought to within 4 or 5 inches of the spot and moved about slowly. The heat from the flame draws the grease to the surface and destroys it. Care must be exercised not to char the car floor.

Reclaiming Worn Spring Equalizers

Q.—The short spring equalizers on some six-wheel passenger car trucks wear at the ends where they fit on the short hangers. What method of repair is suggested?

A.—Several roads have tried to weld plates on these short equalizers without success. One method is to fill in the wear with steel rod. When the applied metal is within a 1/16 in. or so of the proper height, finish with tire steel using a slightly carbonizing flame. Care must be exercised when rebuilding these equalizers that they are not built too thick for the space where they enter the hanger.

Periodic Attention To Passenger Cars*

By E. L. Schaffner

Previous papers presented here in the past have covered periodic attention to freight cars and daily inspection and maintenance of Pullman cars. It is my thought to summarize briefly the various periodic operations required in order to keep passenger cars in service, avoid road delays and eliminate criticism from the traveling public. I shall make a few suggestions which I hope may be of some interest and benefit to our members, especially those in freight yards who are being called on to handle passenger trains in freight service more and more frequently due to movement of trains of troops, defense materials and army equipment.

A regularly followed plan of periodic attention to passenger cars, as well as to any other pieces of railroad or industrial equipment, and even our own automobiles is necessary. This is particularly essential at the present time to keep the maximum number of cars in service, as many cars are being held out of shop for longer periods between class repairs. Various railroads usually designate some assigned point for the maintenance work on certain cars, taking into consideration the amount of time available for such work, with a view to keeping cars from missing their runs. This is an important factor, as the cutting out of certain types of passenger cars, such as deluxe coaches, diners or special type Pullman cars for which there are no replacement cars, results in criticism from the traveling public and in the case of diners, causes considerable confusion and rearranging of dining-car crews. While the A. A. R. Rules cover time limits on air-brake cleaning, and journal-box attention, other periodic operations on the various roads depend on several factors, such as the amount of mileage made by cars, territory through which cars are operated, and length of time cars are out of shop between class repair periods.

Parts Requiring Periodic Attention

The periodic operations on passenger cars can be roughly divided into six groups, covering the following:

Air-Brake Attention

A. A. R. Rules designate a 15-month period of air-brake cleaning for type UC air brakes, and 12-month period for other types of passenger air-brake equipment, except for the new D22A equipment, for which no time limit has as yet been specified, but which we are cleaning on a 15-month basis on our railroad. In addition to the air-brake details which are taken care of at this time, it is advisable to make a thorough check of trucks and brake-rigging conditions, and make necessary repairs to insure continued operation of cars without trouble. Special attention should be given to renewal of worn brake-rigging parts such as cotter keys, hangers, key bolts, gibs, levers, brake beams and heads.

A thorough check of couplers and draft gear should also be made. Loose pedestal and tie-strap bolts should be tightened or renewed, and greasing of center plates and adjustment of side bearings, especially on passenger carrying cars, should be given attention. Lubrication of other parts which are subject to wear or to developing annoying squeaks, such as buffer stems, coupler carrier irons, diaphragm springs, etc., should be taken care of at this time. A thorough "boilerwash" job at the time of this air brake cleaning should keep a car in good running condition for many months without cutting it out for this work.

Journal Box Attention

This job is of the utmost importance in passenger-train operation, especially in view of the number of new men on various railroads now performing this work. Practically all roads follow the six-month period of journal-box attention, as given in the A. A. R., except in cases of some high-mileage cars, which are caught more frequently. It is certainly false economy not to replace a journal bearing at the time of this inspection if there is any question of it giving six months' service.

While we do not want to use bearings wastefully, men should receive careful coaching on this feature, as well as proper instruction in the examination of wedges and the repacking of the boxes in the prescribed manner. Air brakes can be cut out when defective, broken or leaking steam lines can usually get through to the next division point, but a hot journal on a passenger train may result in having to cut the car out at some intermediate point. In some cases this necessitates awakening sleeping Pullman car passengers, which causes bad road delays and inconvenience to and criticism from the traveling public. In the case of roller-bearing wheels, which are being used in increasing numbers in passenger trains, a periodic examination and the filling of boxes to proper height is very important. Oiling periods vary on the different types of bearings, but the usual filling period is every 30 days. While a close daily inspection should be made of roller-bearing boxes at the time of regular inspection, special attention should be given at the time of filling the boxes to check for leaking boxes or gaskets, loose studs, worn filling plugs, etc.

Steam-Heat Attention

This item is of the utmost importance to the traveling public from the standpoint of comfort and to satisfactory railroad operation during the winter months. A thorough inspection and test of all steam-heat details on passenger cars, such as metallic connectors, steam end valves, regulators, steam inlet valves, pipe covering, radiators, thermostats and the overhead heat unit, should be made and defective parts renewed before the start of the steam-heat season. It is advisable to make this campaign in August and September so that cars will be in serviceable condition at the time of the first cold spell.

Electrical Apparatus

The attention to electrical equipment on passenger cars will differ on the various roads, depending on the conditions under which cars are operated. However, on any road, a periodic check of batteries, generator brush racks and generator brushes, regulators and parts, car wiring, etc., should be carefully performed. A careful periodic inspection should also be made of the generator drive, whether it be the flat-belt type, cog-belt type or propeller-shaft drive. Lubrication of drive and other parts of the electrical system is also essential to insure good lights at all times for our railway mail clerks, railway express employees and the travelers.

Air-Conditioning Apparatus

While air conditioning on passenger cars is comparatively new, nothing has done more to attract the traveling public back to the railroads, and any failure of the system, especially in the new type cars with sealed win-

* From a paper presented before the March 17 meeting of the Car Department Association of St. Louis. Mr. Schaffner is gang foreman of the Pennsylvania at St. Louis, Mo.

dows, is a serious cause of complaint. The attention to this equipment will also vary on different railroads as some cars are in cooling service the year round and others are only in service during the summer months. A careful annual overhaul job is essential to place cars in condition for the air-conditioning season and at this time, on mechanical-systems cars, close attention should be paid to all compressor details, piping, thermostats, relays and contacts, refrigerant used in the system, standby motors, batteries, generator, air filters, blower fans and motors, etc.

In the cars which have ice system of cooling, similar items should be given attention and, in addition, spray systems, ice bunkers and doors, pump strainers, water pumps and motors should be thoroughly checked. Attention, adjustment and inspection of these items periodically during the air-conditioning season is necessary to keep the systems running without trouble.

Car Cleaning

Probably the item which the traveling public observes more closely than any of the above is that of car cleaning. While daily interior and exterior cleaning of passenger cars is done at every terminal, a program of periodic interior and exterior cleaning is necessary to keep cars in good condition and suitable for our passengers. The frequency for this work also varies among the roads, depending on individual cars, but the exterior of cars should receive extraordinary cleaning with approved cleaner often enough to keep them looking a credit to the road on which they are operating. Likewise, interior extraordinary cleaning should be done frequently enough to keep the headlining, side walls, seats and cushions, toilets, wash rooms, floors, etc., thoroughly clean at all times.

A skilled painter should also be available when extraordinary cleaning is completed to touch up cars as needed and restore the paint to the original condition, especially in toilets and wash rooms. Drinking-water tanks, coolers and filters should also be cleaned at prescribed periods and the water kept thoroughly clean and pure at all times.

Dealing with Passenger-Refrigerator and Pullman Cars

I might mention one job that troubled all railroads in the St. Louis Terminal for quite a while but which is now being satisfactorily handled. The suggestions as given in the preceding pages as regards periodic attention are followed religiously on many railroads on their own equipment but in the case of cars of private ownership (R. E. X.-P. F. E.-N. R. C., etc.) and Pullman tourist type cars used in troop movement, little or nothing was done on these cars until they were ordered out. As a result, in many cases, a road was offered cars for movement on their line on short time, which had come in on other roads, many of which were overdate for air-brake and journal-box attention, or had defective wheels, steam-heat defects, etc. A plan has been inaugurated whereby extra inspectors are put on to keep in close contact with the Pullman Company and make prompt inspection of all Pullman tourist cars in the St. Louis area. In the case of any overdate air brakes, journal boxes, or other work required before they could be moved, the cars are shipped back to the road which had previously brought the cars into St. Louis, and they make the repairs. This has resulted in keeping these Pullman tourist cars repaired much more promptly and ready to move in most cases when needed.

A similar procedure should be followed with passenger-refrigerator cars, especially those of private ownership, many of which will start to move through this gateway very shortly for strawberry loading in the Missouri-Arkansas strawberry fields, and with which all roads experienced trouble last year in movement over their line.

I have only endeavored to cover this subject in general and have not mentioned conditions which are developed in daily inspection, such as wheel defects, etc. With the present volume of passenger traffic, it is essential that all cars possible be kept in service and a close adherence to a plan of regular periodic attention will result in keeping cars in service the maximum amount of time.

Improved Impact Wrenches Increase Shop Production

Well-known and widely-used in railroad shops, impact wrenches manufactured by the Ingersoll-Rand Company, Phillipsburg, N. J., have been increased in range of application by the addition of Size 504 and Size 508 models. The Size 504 is for nuts up to and including 3/8-in. bolt size, the 508 has a capacity for nuts up to 5/8-in. bolt size. Light in weight and sturdy in construction these new tools use a patented principle for localizing steel-to-steel impact without transmitting shock and subsequent wear to other parts of the tools.

Size 508 Impact wrench, with adapter, tightening 1/2-in. floor bolts

Reversible in operation these wrenches are so designed that no reversing gears are used. Torque action has been reduced so that one-hand operation is possible and small nose diameter and short over-all length permits operation in close places.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. A. R. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Term "Worn Out" Sufficient Description For Journal-Bearing Renewal

On September 21, 1940, the Gulf, Mobile & Ohio repaired Georgia Rosin Products Company car GROX Car No. 80 and included in its bill an item of $4.08 for replacing four journal brasses, giving as its reason for the replacement the fact that the old ones were worn out. The car owner took exception to the bill on the ground that the term "worn out" did not appear as one of the six different reasons for making such repairs under Section (j) of Rule 66. The G. M. & O., in its statement, said that while Rule 66 specifically mentions six defects for condemning brasses, the term "worn out" would define the defects under Items 2, 4 and 6.

In a decision rendered April 10, 1941, the Arbitration Committee ruled that the term "worn out," when used to describe the cause for removing a journal bearing, is generally recognized as representing one or more of the conditions under paragraph (j) of Rule 66 and on that ground the contention of the Georgia Rosin Products Company was not sustained.—*Case No. 1785, Georgia Rosin Products Company versus Gulf, Mobile & Ohio.*

Air Brake Questions and Answers

HSC High-Speed Passenger Brake Equipment

1—*Q.—What is this equipment designed for?* A.—For passenger trains operating in ultra high-speed service.

2—*Q.—What is the object of the brake as so designed?* A.—To obtain shorter stopping distances and freedom from slid wheels.

3—*Q.—Why is there a need for such a brake at this time?* A.—Because of the step-up in all train speeds of the modern type, it is absolutely necessary to furnish more modern and effective control.

4—*Q.—How is a more effective control achieved?* A.—By improving any elements that may be associated with the problem of train retardation.

5—*Q.—What elements enter into this problem in their order of functioning?* A.—(*a*) Means for transmitting the desired brake action from the engineman's brake valve in the locomotive to the last car in the train. (*b*) The triple valve which controls the flow of air to and from the brake cylinder. (*c*) The brake rigging which conducts the force from the source of power to the brake shoes. (*d*) The brake shoes. (*e*) The wheels. (*f*) The running rails.

* This is a new series of questions and answers. As in previous series references to figure and part numbers are to the manufacturers' instruction pamphlets.

6—*Q.—What improvement is made with the transmitting elements?* A.—As the pneumatic form of transmission is definitely limited in its speed of functioning, which limit has been practically reached with modern pneumatic devices, it is necessary to incorporate a substitute in order to effect an appreciable saving in time from the brake-valve movement to the brake action throughout the train. This improvement is accomplished by the use of electric action.

7—*Q.—Why is this improvement satisfactory* A.—This action, being practically instantaneous, results in a material decrease in stopping distance.

8—*Q.—Give an illustration of such saving.* A.—Assuming an 18-vehicle train, including the motive power, the time of pneumatic transmission from the locomotive to the last car is about 4½ seconds, while the time of electrical transmission is virtually zero. At a speed of 100 m. p. h., train movement is 146 ft. per second. In consideration of the above comparison, it can be easily understood that the stopping distance is cut down considerably.

9—*Q.—What improvement is made with the operation of the second element (the triple valve)?* A.—As the triple valve is moved to its various operations by the transmitting element, an additional device is provided, which automatically regulates the braking force proportional to its speed. This device makes it possible to employ a much greater braking force in the high-speed zone than was previously possible.

10—*Q.—Why is this augmented braking force in the high-speed zone beneficial?* A.—Because the brake shoe friction decreases and distance traveled per second increases rapidly with increased train speed.

11—*Q.—What improvement is made in connection with the third element (the brake rigging)?* A.—Higher efficiency in force transmission is obtained through the reduction in weight and number of parts incident to mounting the brake cylinder on the trucks instead of the car body.

12—*Q.—Discuss briefly the last three elements mentioned.* A.—A new form of brake shoe is under consideration and will be discussed elsewhere. The braking portion of the wheel's work is taken over by a new friction element associated with the brake shoes. Through the use of the new device that regulates the brake-cylinder pressure in proportion to the speed and the one that counteracts the ill effects of low adhesion. As will be shown, cases of slipping wheels will be limited to the occasional instances when rail adhesion is sub-normal, as occasioned by water dropping on the track from the train or oily spots encountered at highway crossings.

13—*Q.—What are the important features of the HSC equipment?* A.—(*a*) Suitable for either ultra high speed or conventional passenger trains of one to 24 cars. (*b*) Fast application and release with self lapping electro-pneumatic control to afford maximum flexibility and smooth operation. (*c*) Speed governor control of braking pressures in conformity with speed, for the purpose of holding the retardation effort of the brake shoes as nearly uniform as practical. (*d*) Improved pneumatic brake operating features when used in conventional passenger service. (*e*) Pneumatic emergency brake immediately available by use of brake valve emergency position in the event that the electro-pneumatic brake does not function normally. (*f*) Pneumatic emergency brake obtainable at any time equipment is charged by means of the brake valve, conductor's valve, or ruptured brake pipe or connections. (*g*) Higher braking force available for emergency than for service to offer needed protection for unexpected emergencies during service stops.

Parts of the Equipment

14—*Q.—Name the parts which make up the equipment.* A.—Referring to Fig. 15 (Instruction Pamphlet No. 5064, Supplement 22) D-22-BR control valve; an F-1864, or FS 1864 relay valve; A-2 continuous quick service valve; combined auxiliary, emergency and displacement reservoir; No. 21 B-magnet bracket; brake cylinders; supply reservoirs, B3B conductor's valve; E-3 brake application valve; combined dirt collector and cut-out cock; automatic slack adjuster. Various cut-out cocks, hose connections, dummy couplings, branch pipe tees, piping, etc., are also used. The water raising system is not a part of the air brake system, but air pressure for its operation is supplied from the system. The train air signal system is not a part of the brake equipment and will be discussed later. Referring to Fig. 16, other parts are as follows: Axle generator; relay cabinet; plug connector; thermo-flip-on switch; contactor; back-up valve.

15—*Q.—What are the functions of the D-22-BR control valve?* A.—This valve corresponds in a general way to the universal valve now in common use. It is designed as a piloting device for operation of one or more large capacity relay valves. It operates to control the admission of air to, and exhaust from the relay valves, and to charge the reservoirs.

16—*Q.—What are the functions of the relay valves?* A.—To relay the application and release operation of the control valve. The FS 1864 relay valve is used on cars having speed governors (in this installation the first and last cars of the train). All other cars and Diesel power units have the F-1864 relay valve. The two types are similar with the exception that F-1864 does not have the K-3 switch portion.

17—*Q.—What are the functions of the continuous quick-service valve?* A.—To transmit local quick service activity from car to car to provide fast transmission of the brake pipe reduction, particularly on successive brake pipe reductions following the initial reduction.

18—*Q.—What are the functions of the combined reservoirs?* A.—(*a*) Auxiliary reservoir provides the air supply for proper functioning of the control valve service portion. (*b*) The emergency reservoir is used to provide the quick recharge, graduated release and the high emergency pressure features. (*c*) The displacement reservoir provides the required operation volume to develop the proper relation of the brake pipe reduction.

19—*Q.—What are the functions of the No. 21-B magnet bracket?* A.—To apply or release the brakes on the car during the HSC electro-pneumatic operation.

20—*Q.—How do the brake cylinders function?* A.—As in all cases, cylinders with piston rods so connected through the brake levers and rods to the brake shoes that when the pistons are forced outward by the air pressure, this force is transmitted through the rods and levers to the brake shoes and applies them to the wheels.

21—*Q.—What are the functions of the supply reservoirs?* A.—To supply air to the brake cylinders.

22—*Q.—What are the functions of the B-3B conductor's valve?* A.—To permit the conductor to apply the brake in case of emergency.

23—*Q.—How does the E-3 Brake application valve function.* A.—To vent the brake pipe when actuated by the conductor's valve.

24—*Q.—What is the purpose of the combined dirt collector and cut-out cock?* A.—The dirt collector prevents the entrance of pipe scale, sand, cinders, or foreign particles of any kind into the control valve. The cut-out cock provides a means of closing the brake-pipe connection between the control valve and the brake pipe.

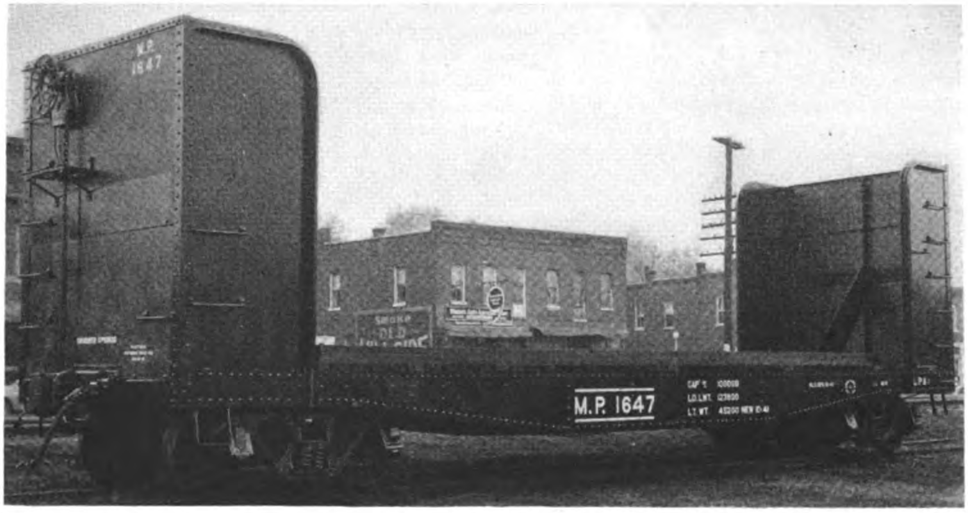
25—*Q.—How does the slack adjusted function?* A.—Maintains a predetermined brake cylinder piston travel.

26—*Q.—What is the purpose of the axle generator?* A.—To register train speed. One generator is mounted on an axle of the first car and one on the last car of the train in this installation.

27—*Q.—How does the relay cabinet function?* A.—It limits the brake cylinder pressure in proportion to the train speed. One each is also located on the first and last cars in this installation.

Pulp Wood Cars For the M. P.

The illustration shows one of a series of 150 pulp-wood cars recently constructed at the De Soto, Mo., shops of the Missouri Pacific, and assigned to service in the Southern and Western districts, where a total of 418 of these cars are now in use. The same underframe construction is used as with Missouri Pacific standard flat cars and consists of fish-belly-type side and center sills. The steel ends and end side panels are applied for the purpose of supporting the pulp-wood load. These cars are 44 ft. 6 in. long over the coupler pulling bases and 31 ft. between truck centers. The ends are 9 ft. 1⅜ in. high and the side panels are 61½ in. wide.



Missouri Pacific pulp-wood car which has an average light weight of 44,600 lb. and capacity to carry 21 cords

High Spots in

Railway Affairs . . .

N. Y. C. Employees Donate Bomber

New York Central employees, with a suitable ceremony in the Grand Central Terminal in New York on Sunday, April 19, turned over to the United States Army a check for $165,000 for the purchase of a bombing plane. Russell M. Church, a draftsman with that railroad and father of Lieut. R. M. Church, Jr., who was killed in action in the Philippines in January, was selected to make the presentation The occasion was dramatized by the presence of a detachment of troops and a military band, and was presided over by James A. Farley, former postmaster general.

Training of Supervisors

One of the most serious problems involved in the gigantic effort to increase production of war materials has been that of supervision. There have not been enough trained foremen and supervisors, and many of those occupying such positions have not had the advantage of the most up-to-date practices. Recognizing this, the Federal Security Agency has found it possible to introduce classes of various sorts in hundreds of accredited colleges and universities throughout the country. Information about these classes is set forth in circular E. S. M. D. T.—Misc.—258, which may be obtained from the Federal Security Agency, U. S. Office of Education, Washington, D. C. A number of employees of the New York Central have been very much impressed by the value of a course entitled "Foreman or Supervisory Training," which they are now taking at New York University.

How to Overcome Labor Shortages

The railroads are becoming seriously embarrassed by the labor shortage which promises to become more and more critical. Greatly increased business on the one hand, and the draft on the other, make it necessary to adopt positive and constructive measures to protect themselves in this respect. The Office of Defense Transportation, which has been making a critical study of the problem, suggests: (1) Raise the hiring-age limits and relax physical requirements. (2) Make a drive to rehire former employees, including those who have quit and those who have retired. (3) Utilize all state and federal aids to improve apprentice and learner training methods, and speed up apprentice training by agreement with labor. (4) Survey situation on each railroad to determine possibilities of upgrading employees to more skilled positions and utilizing more skilled workers to instruct and guide semi-skilled workers. (5) Employ women wherever possible. (6) Make full use of governmental employment services. (7) Establish a clearing-house by which the various railroads can exchange information on man-power and self-help measures. (8) Organize effective personnel management system for each carrier under appropriate supervision and direction.

Opposes Setting Clocks Ahead

There is a strong sentiment in some parts of the country that single states or regions, including parts of several states, should be permitted to set clocks an hour ahead of war time during the summer months. Director Eastman of the Office of Defense Transportation has come out strongly against such action, either for scattered communities within a state, or an entire state. Unless observed on a wide basis, says Mr. Eastman, "it would create growing demands for service, which would, to the extent that they could be met, absorb crews, coaches, locomotive power, in a time when it is essential that passenger service be maintained on a most economic and efficient basis if carriers are to meet demands for military movements and necessary traffic directly connected with the war."

Bottlenecks in Highway Transportation

Director Eastman of the Office of Defense Transportation is seriously concerned over the slowing down of the movement of vital military supplies on the highways. Because of the existing state restrictions he is urging federal legislation to eliminate these bottlenecks. "I am satisfied," said Mr. Eastman, "that there is actual, continuous and substantial interference with interstate movement of vital war materials and supplies in many states of the union. Complaints of such instances are made to this office almost every day, some of them disclosing quite serious situations. . . . I think it should be said that many of the states have made a sincere effort to be helpful in permitting the free flow of vital traffic by motor vehicle, notwithstanding existing state restrictions. In many others, however, there is no apparent disposition to depart from the peacetime policy of strict enforcement, or to remove existing hampering regulations in time of war."

Retirement Board Moving to Chicago

The Railroad Retirement Board was one of the bureaus which were crowded out of Washington because of the serious congestion in our Capitol under war conditions. The America Fore Building in Chicago was purchased and has been in the process of refitting to house the board with its various bureaus and voluminous service records. A special train of 22 cars of office furniture and equipment arrived in Chicago on April 6, and the Bureau of Wage and Service Records started to get settled in its new quarters. Other bureaus of the board are being moved as rapidly as the building can be remodeled for their use. Of the 1,700 persons employed by the board, it is estimated that about 1,000 will move to Chicago. Replacements will be made from civil service lists.

Transportation of Industrial Workers

The drastic reduction in the amount of rubber available for automobile tires promises to complicate seriously the problem of transporting workers in the essential war industries to and from their homes. Many of these industries are located outside of the population centers and because of lack of housing in the immediate vicinity of the plants, workers must travel long distances. The problem of the Houston (Texas) Shipbuilding Company is being solved with the aid of the United States Maritime Commission, which has made special arrangements with the Public Belt Line Terminal and affiliated railroads. The necessary passenger equipment is being provided by the purchase of 42 coaches formerly owned by the New York, Westchester & Boston.

Tank Car Records Climb

For many weeks the tank car movement to the East Coast has been climbing steadily upward and establishing new records. The latest information at the time this was written was for the week ending April 11, during which a total of 586,350 barrels were moved daily. To make this movement the twenty oil companies reporting loaded a total of 18,243 cars. This must indeed be a source of satisfaction to the A. A. R. and its members, who were rather roundly scolded by Petroleum Coordinator Harold L. Ickes several months ago, when he questioned the ability of the railroads to utilize the tank cars to any great advantage in transporting oil to the East Coast.

Among the Clubs and Associations

Alternate Journal-Bearing Design License

THE modified design of standard journal bearing, developed by the A. A. R. Mechanical division to conserve copper and tin and described in the February *Railway Mechanical Engineer,* page 73, included an alternate design with depressed back which is covered by U. S. patent No. 2154916 issued to the Railway Service & Supply Corp., Indianapolis, Ind. In a letter dated April 10, V. R. Hawthorne, executive vice-chairman of the Mechanical division, states that the owner of this patent has agreed to license it to manufacturers of journal bearings so that railroads may use this patented feature on freight-car journal bearings for the duration of the war to conserve the critical materials, copper and tin.

A license form, approved by the A. A. R. law department, has been prepared and may be executed by a bearing manufacturer or any railroad which makes and uses its own freight-car journal bearings. It will not be necessary for a railroad or car owner which buys all of its bearings from a licensed manufacturer to execute this agreement. The nominal royalty requested for the use of this patent during the war period is $1 per year.

Conservation of Tin

IN an A. A. R. Mechanical Division letter, dated April 11, attention is called to the importance of doing everything possible to restrict the use of tin to absolute necessities. In the interest of tin conservation, every railroad is requested to give fair trial to such substitutes as have been developed and offered for use. In this connection, the letter states that the North American Smelting Company, Philadelphia, Pa., has developed a tin-free solder known as North American Victory Solder, the possibilities of which should be fully developed.

In addition, the Federated Metals Division of the American Smelting & Refining Company has developed "G" babbitt metal which contains little or no tin. (One large railroad reports testing one of these babbitts with about 1 per cent tin with satisfactory results.)

The Magnus Metal Corporation advises that it is in position to supply "Satco" metal (which contains 1 per cent tin) for use as a babbitt metal. This information is transmitted with the suggestion that these companies be contacted for information as to materials which may facilitate materially restricting the use of tin by railroads.

Standard Cars Approved by Letter Ballot

AS instructed by the Board of Directors of the Association of American Railroads, the Mechanical division Committee on Car Construction, in cooperation with the American Railway Car Institute, has developed designs covering standard A. A. R. box and automobile-box cars having inside dimensions of length, 50 ft. 6 in.; width, 9 ft. 2 in.; height at eaves, 10 ft. 6 in. These are steel-sheathed, wood-lined cars, the box car having alternate arrangements for clear side door openings of 6 ft., 7 ft., and 8 ft., respectively. The automobile-box car has a 15-ft. clear side door opening, with alternate arrangement for an end door. These box-car designs were submitted to letter ballot in a circular dated February 24, 1942, and, as a result of a strongly favorable vote, have been approved by the association for inclusion in a supplement to the Manual of Standard Practice of the Mechanical division.

Proceedings Coordinated Mechanical Associations

THE proceedings containing the reports and addresses presented at the meetings of the four Coordinated Mechanical Associations held at Chicago, September 23-24, 1941, have been published as follows:

Master Boiler Makers' Association.—A. F. Stiglmeier, secretary-treasurer, 29 Parkwood street, Albany, N. Y. 214 pages. Price, $5.

Car Department Officers' Association.—Secretary-treasurer, F. L. Kartheiser, chief clerk-mechanical, Chicago, Burlington & Quincy, Chicago. 202 pages. Price, $2.

The Railway Fuel and Traveling Engineers' Association.—T. Duff Smith, secretary-treasurer, 327 South La Salle street, Chicago. 336 pages. Price, $3.

Locomotive Maintenance Officers' Association.—C. M. Lipscomb, secretary-treasurer, care of Missouri Pacific Shops, No. Little Rock, Ark. 196-pages, spiral bound. Price, $3.

F. E. Cheshire Pays Tribute to Supply Companies

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Meeting held March 9. Speaker: F. E. Cheshire, assistant superintendent car department, Missouri Pacific. Subject: The Modern Freight Car. ¶Mr. Cheshire traced the development of freight cars from the earliest types to efficient modern units and emphasized the vital part which railway car men have played in perfecting design details, improving maintenance practices and securing increased utilization of freight car equipment. Regarding the contribution of railway equipment and supply companies to this important work, Mr. Cheshire said: ¶"Contributing the engineering genius and service assistance of their organizations, the supply companies have marched side by side, through good times and bad, with the builders and operators of freight cars. They have produced new materials, new devices and improvement in existing appliances. The modern draft gear, the coupler, the air brake, doors and fixtures, the modern car wheel, improved trucks, the metal running board, cars with loading devices to simplify and expedite loading, stowing and unloading; and numerous other integral parts of the American freight car stand as monuments to railway supply companies and their contribution to the modern freight car."

A. S. M. E. Railroad Division Studies Material Needs

THREE phases of the vital material problem which confronts the railways, namely, conservation, substitution and reclamation, will be analyzed and discussed at the railroad sessions of the semi-annual meeting of the American Society of Mechanical Engineers which are scheduled to be held Wednesday, June 10, 1942, at the Hotel Statler, Cleveland, Ohio. This meeting is part of the general three-day program of the society which will be held June 8-10, inclusive, and follows the semi-annual dinner on the evening of Tuesday, June 9.

Details of the program sponsored by the Railroad Division of the Society are given below.

It is anticipated that about 300 mechanical engineers and executives representing both the railroads and railway supply companies will be present at this meeting and participate in the discussion which is designed to throw additional light on the important material problems now confronting the railways.

MORNING SESSION

Opening remarks by Joseph B. Eastman, director, Office Defense Transportation, Washington, D. C.

Paper on Conservation, by A. G. Hoppe, assistant mechanical engineer, Chicago, Milwaukee, St. Paul & Pacific.

Paper on Substitution, by C. B. Bryant, engineer of tests, Southern.

AFTERNOON SESSION

Remarks by Andrew Stevenson, chief, Transportation and Farm Equipment Branch, War Production Board, Washington, D. C.

Paper on Reclamation, by G. A. Goerner, general storekeeper, Chicago, Burlington & Quincy.

General discussion on all papers at the conclusion of Mr. Goerner's presentation.

NEWS

WPB Transportation Branch Appointments

The appointment of Sidney L. Miller as assistant chief of the War Production Board's Transportation Branch has been announced by Andrew Stevenson, branch chief. Mr. Miller was formerly executive head of the Bureau of Business Research at the University of Iowa, and from 1916 to 1925 he was instructor of economics and transportation at the University of Wisconsin.

Mr. Stevenson also announced the following additional appointments:

David W. Odiorne, chief of the Rolling Stock Section. Mr. Odiorne has been connected with the New York Central as special inspector and supervisor of service tests for materials and appliances on locomotives and cars.

E. Carroll Hanly, chief of the Motive Power Section. Mr. Hanly formerly was with the Pennsylvania as foreman in charge of building and repair of rolling stock and locomotives.

ODT Appointments

Charles T. Ripley, chief engineer, Technical Board of the Wrought Steel Wheel Industry, has been named a consultant on Diesel engine propulsion equipment in the Section of Materials and Equipment, Office of Defense Transportation. Mr. Ripley took over that assignment in addition to his present job as consultant on steam, Diesel and electric locomotives, when the original appointee—H. L. Hamilton, manager of the Electro-Motive Division of the General Motors Corporation—was unable to accept the position.

E. R. Hauer, engineer of motive power, Mechanical Advisory Committee, Chesapeake & Ohio, Erie, New York, Chicago & St. Louis, and Pere Marquette, has been appointed an assistant director of the Office of Defense Transportation's Division of Railway Transport. Mr. Hauer will be "in charge of mechanical operations," working "to increase further the efficiency of the nation's railway equipment," according to the ODT announcement.

W. P. B. Risks Fall Transportation Shortage

On April 8 the War Production Board announced that materials would be allocated during the remainder of 1942 for the production of 18,000 freight cars and 300 locomotives, in addition to the 45,000 cars and 926 locomotives contemplated in the schedules running to May 1 which were approved on January 2 by the former Supply Priorities and Allocations Board. No assistance will be given for additional passenger car construction, but "materials will be made available to complete Army and lend-lease orders" for railroad rolling stock.

Limitation orders on April 4 froze all unfinished cars and locomotives in the hands of producers. At that time, the locomotive program authorized by SPAB was "ahead of schedule"; but deliveries under the freight-car program were delayed—19,000 cars remaining to be delivered by May 1. These 19,000 cars and the 18,000 others now authorized, along with locomotives hereafter produced, will now be rationed among using railroads by the WPB's Transportation Branch, "acting upon recommendations of the Office of Defense Transportation."

(According to figures compiled by the Railway Age, the number of freight cars delivered during the first three months of 1942 totaled 21,619. The backlog of unfilled orders on March 31 totaled 47,297. Orders of locomotives for domestic service during the first three months totaled 202 steam, 131 Diesel-electric, and five electric locomotives. Of the 131 Diesel-electric locomotives, 123 are for railroad service and include 21 of 5,400 hp.; 5 of 4,050 hp., and 2 of 4,000 hp.)

The WPB control of production and deliveries will be operated under General Limitation Order L-97 which applies to locomotives, and General Limitation Order L-97-a which applies to freight and passenger cars. Both set forth that "the fulfillment of requirements for the defense of the United Sates" has created a shortage in the supply of railroad equipment; and "it now becomes necessary in the public interest and to promote the national defense to provide for the orderly scheduling of production and delivery" of such equipment. The restrictions on production and delivery of equipment apply "irrespective of the terms of any contract of sale or purchase or of any other equipment;" while the production and delivery schedules to be established by WPB "shall be maintained without regard to any preference ratings already assigned or hereafter assigned to particular contracts . . . and without regard to production schedules in effect on the effective date of this order. . . "

In fixing the production schedules WPB will be interested in as much concentration as is practicable in order that some plants now building railroad equipment may be released for the production of war materials.

In assuring the Industry Committee that materials will continue to be made available to complete the SPAB program, Andrew Stevenson, chief of the Transportation Branch, WPB, said that "inventories now held by the entire industry will have to be used for this purpose, and pooling of materials may be necessary." As to the locomotive phase of the new program, he said that the 300 additional engines now authorized will include 250 steam locomotives and 50 Diesel-electrics. Construction of the latter, however "must not interefere with output of Diesel engine crankshafts for military use."

In discussing the effect of the WPB action on their equipment programs, railroad

(Continued on next left-hand page)

Orders and Inquiries for New Equipment Placed Since the Closing of the April Issue

Locomotive Orders

Road	No. of Locos.	Type of Locos.	Builder
Alabama, Tennessee & Northern	1	80-ton Diesel-elec.	General Electric Co.
Bessemer & Lake Erie	5	2-10-4	Baldwin Loco. Wks.
	2	0-8-0	American Loco. Co.
Duluth, Missabe & Iron Range	10	2-8-8-4	Baldwin Loco. Wks.
Laurinburg & Southern	1	44-ton Diesel-elec.	General Electric Co.
Patapsco & Back Rivers	2	1,000-hp. Diesel-elec.	Electro-Motive Corp.
	2	600-hp. Diesel-elec.	
Philadelphia, Bethlehem & New England	2	1,000-hp. Diesel-elec.	Electro-Motive Corp.
	2	600-hp. Diesel-elec.	
Southern	1	4,000-hp. Diesel-elec.	American Loco. Co.
	1	4,000-hp. Diesel-elec.	Electro-Motive Corp.

Locomotive Inquiries

Road	No. of Locos.	Type of Locos.	Builder
Baltimore & Ohio	25	1,000-hp. Diesel-elec.	....
Western Pacific	6	4-8-4	....

Freight-Car Orders

Road	No. of Cars	Type of Car	Builder
Baltimore & Ohio	25	50-ton hopper	Bethlehem Steel Co.
Canadian Pacific	500	40-ton box	Canadian Car & Fdry. Co.
	200	50-ton box	National Steel Car Co.
	150	70-ton ore	
	50	50-ton box	Eastern Car Co.
Duluth, Missabe & Iron Range	500	75-ton ore	American Car & Fdry. Co.
	500	75-ton ore	Gen. Amer. Transp. Corp.
	500	75-ton ore	Pull.-Std. Car & Mfg. Co.
	500	75-ton ore	Pressed Steel Car Co.
National Rwys. of Mexico	500	50-ton box	American Car & Fdry. Co.
Pittsburg & Shawmut	..[1]	50-ton hopper	Pressed Steel Car Co.

Freight-Car Inquiries

Road	No. of Cars	Type of Car	Builder
Bethlehem Steel Co.	12	100-ton flat	....
Seaboard Air Line	500	50-ton box	....

[1] For August delivery.

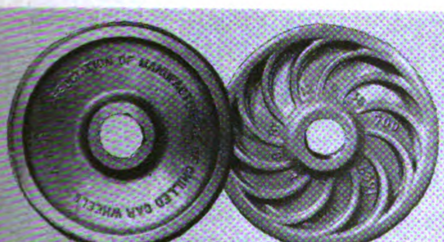
Note: In the April issue, the Union Pacific was reported to have ordered 1,000 50-ton gondolas from the Pullman-Standard Car Manufacturing Company. This order has been suspended awaiting action by the War Production Board.

NO
Critically Strategic Metals are Needed
TO MAKE
CHILLED CAR WHEELS

No stock piles are called on for scarce metals to help make Chilled Wheels.

Only iron is required and much of that is used over and over as the Wheels retired from service are returned to our foundries under the unique exchange plan.

Where a shortage of used wheels exists, the industry is dependent upon pig iron, but under the officially approved plan of the W. P. B., manufacturers are able to continue to make the vitally necessary wheels for railroad service.



Chilled Car Wheels not only save money, but today they save priceless metals for use where they are indispensable in winning the war.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

230 PARK AVENUE,
NEW YORK, N. Y.

445 N. SACRAMENTO BLVD.,
CHICAGO, ILL.

AMCCW

ORGANIZED TO ACHIEVE:
Uniform Specifications
Uniform Inspection
Uniform Product

men are inclined to build up their twelve-months figures on an October-to-October basis. The program running from October 1, 1941, until October 1, 1942, which was developed during the latter part of last year, contemplated the acquisition of 113,-594 freight cars. Under that program 24,793 cars were installed in service during October, November and December, 1941. Assuming that the 62,143 cars to be made available in 1942 will be delivered by next October, the October-to-October total becomes 86,936 cars or 26,658 fewer than the 113,594 which the carriers hoped to get.

As to the types of cars which will be built, the Transportation Branch has been receiving recommendations from the Office of Defense Transportation, while ODT in turn has consulted with the Association of American Railroads. The first tentative breakdown of the WPB's 18,000 was: 5,750 hopper cars; 5,750 gondola cars; 2,500 flat cars; and 4,000 tank cars. Later revisions, however, may bring changes in order to work in some box cars. Also, a small number of cabooses or special-type cars may be permitted. If so the number of tank cars will be reduced accordingly.

Standardization of Car Repairs Advocated — A Correction

THE omission of the word "not" in the paragraph on the Standardization of Car Repairs Advocated on page 154 of the April issue of the *Railway Mechanical Engineer* changes the meaning of a statement made therein. The first two sentences should have read: "The standardization of both passenger and freight equipment is largely responsible for railroads of the United States weathering the last depression as well as they did. However, the policy of standardization has *not* gone far enough."

Unfortunately, the author's name was also incorrectly spelled. A. D. Alford, general car foreman of the Illinois Central at New Orleans, La., submitted this thought as well as that on the pooling of passenger equipment on the same page in the competition on ways and means of improving mechanical department operations to meet the war emergency.

P. R. R. Crew Drives in for Repairs at "Service Station"

THE engine crew of a westbound passenger train on the Pennsylvania between Pittsburgh, Pa., and Chicago recently stopped for repairs at a factory along the line, thereby cutting what might have been a long delay to a minimum, and preventing a partial tie-up of traffic on an extremely busy piece of railroad. Engineman John Lorne and Fireman H. H. McMurray, at the head end of Train No. 113, felt the air brakes apply automatically about three miles west of Beaver Falls, Pa. They found that the pipe feeding steam to the air compressor on the locomotive was disconnected, causing the compressor to be inoperative.

It was impossible to move the train unless the pipe was replaced. A quick examination showed that if a new thread were cut on the pipe it could be recoupled with ease. Across the tracks a sign proclaimed that the Babcock & Wilcox Company manufactured steam boilers on the premises. Surely the best place in the world to find a pipe-fitting tool. Accordingly the engineman, disconnecting the pipe, took it over to B. & W., selected pipe stock and die of the right size and, with the assistance of a plant employee, cut a new thread thereon. Returning to the locomotive he and the fireman together replaced the pipe and made the proper coupling. The brakes were promptly released and Train No. 113 proceeded on its way—after a detention of only 35 min.

Pendulum Cars Tested

APPROXIMATELY 150 railway officers and members of the Chicago Association of Commerce participated in a test run of the three new pendulum cars, owned by the Atchison, Topeka & Santa Fe; the Chicago, Burlington & Quincy and the Great Northern, respectively, on April 13. These cars were assembled, with two streamlined coaches of latest designs, into a train which was operated from Chicago to Galesburg, Ill., by the Burlington and returned over the Santa Fe. The test was a high-speed run throughout, approximating 85 m. p. h. cruising speed and reaching a maximum of 105 m. p. h.

WPB Estimates Too Low — Eastman

DIRECTOR Joseph B. Eastman of the ODT, speaking before the Atlantic States Shippers' Advisory Board in Philadelphia on April 9, made it quite clear that he disagreed profoundly with the allotment which the WPB has made for railroad equipment construction during the balance of the current year.

Nothing enters into this war, he explained, in which transportation is not an ingredient—"not merely indispensable, but all-pervasive. Why," he then observed, "in the organization of WPB, transportation should be classed along with civilian supply, I am unable to understand."

It is easy to regard transportation as a function of minor importance so long as everything goes smoothly, he said, but just wait till there is a *hitch* somewhere, as there was recently in the port of Philadelphia. Then people begin to see how vital transportation really is to everything we must do in fighting this war.

Director Eastman indicated that he was not going to accept the WPB's meager estimate of the country's needs for transport materials. He is going to continue to insist that the WPB quotas be raised, and he hopes there will be "modifications." "Conversations will continue," he added.

Complimenting the railroads and shippers in terms of highest praise for efficiency of railroad performance which they have co-operatively achieved, the speaker declared that still more strenuous efforts would be needed. He cited the increase in tank-car movement of petroleum products to the Atlantic seaboard from 70,000 bbl. daily last fall to more than 500,000 bbl. daily now; and also the withdrawal of coastwise and intercoastal ships, throwing long hauls on the railroads.

The country is rapidly accelerating to production levels heretofore unheard of at any time or place—and this alone would put a strain on the rail carriers, even if they did not have diverted traffic from other agencies of transportation to concern them. The speaker drew attention also to great shifts in the direction of traffic (westward in the Pacific Coast area, for example, instead of predominantly eastward, as always heretofore).

Railroads and the New Manpower Commission

THOSE activities of the Office of Defense Transportation which relate to labor supply requirements and those of the Railroad Retirement Board with respect to employment service will be brought under the jurisdiction of the new War Manpower Commission headed by Paul V. McNutt, Federal Security Administrator, as a result of an executive order issued on April 18 by President Roosevelt. The aforementioned are listed among the agencies which "shall conform to such policies, directives, regulations and standards as the chairman may prescribe in the execution of the powers vested in him by this order, and shall be subject to such other coordination by the chairman as may be necessary to enable the chairman to discharge the responsibilities placed upon him."

The activities of the Railroad Retirement Board have dealt mainly with recruiting replacements for the carriers, while the ODT has been working on the subject of the manpower needs of the railroads in relation to the operation of Selective Service.

All Efficiency Records Shattered in 1941, Says Pelley

"AMERICAN railroads shattered all previous efficiency records and set up new ones in moving the unprecedented freight traffic of the country in 1941," according to complete reports for that year, J. J. Pelley, president of the Association of American Railroads, announced recently. As reported by Mr. Pelley, the outstanding operating performance of the railroads in 1941 follows:

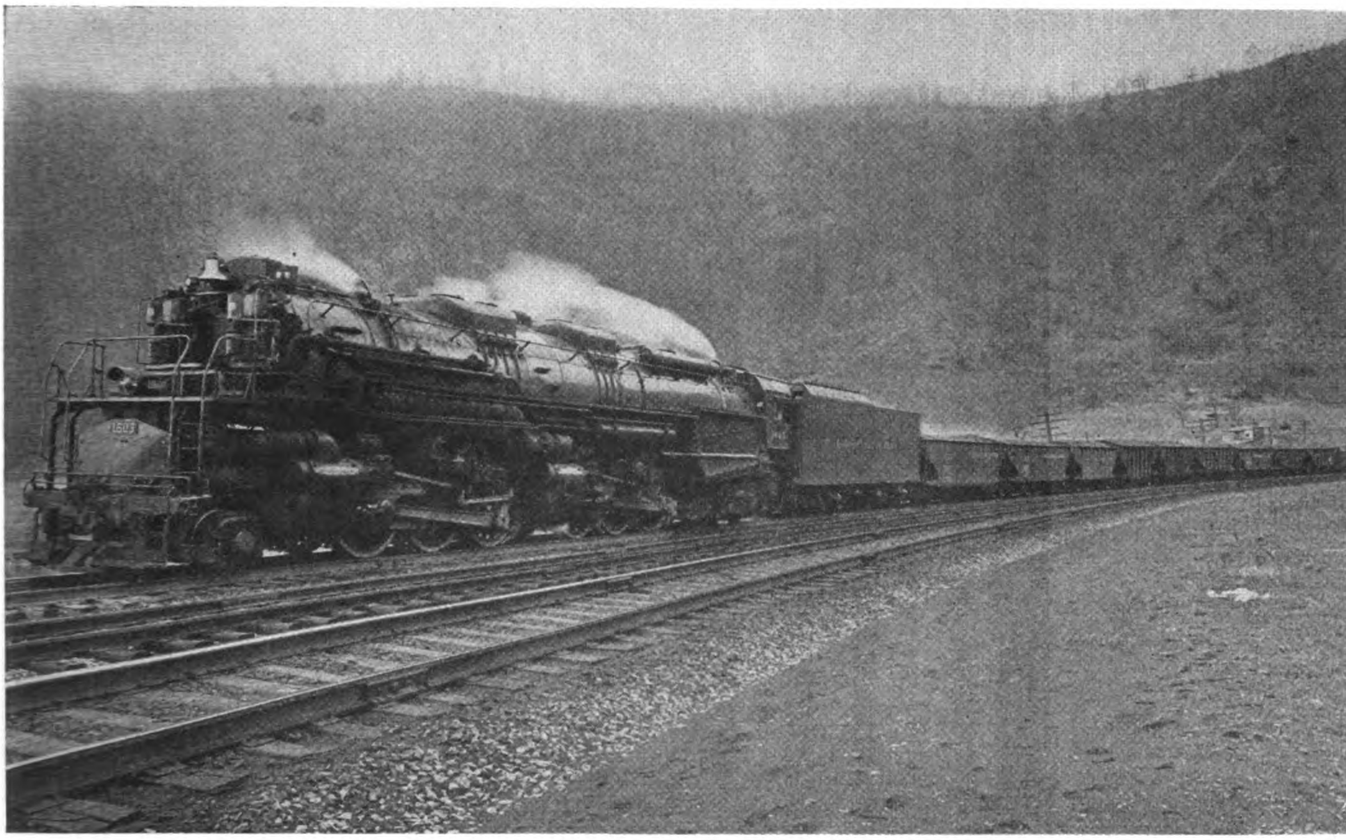
"Outstanding in railroad performance was the increase in the amount of freight that was carried per train, that average in 1941 having been 915 tons, or an increase of 41 per cent compared with 1921. In 1940 the average was 849 tons and in 1929, the year of heaviest traffic in the history of the railroads, it was 804 tons.

"Freight-train performance in 1941 was approximately twice that of twenty years ago. That is, gross ton-miles per train hour increased from 16,555 in 1921 to 34,-684 in 1941, or 109.5 per cent, while net ton-miles per freight train hour increased from 7,506 in 1921 to 14,938 in 1941, or 99 per cent. These are new high records in both instances.

"Freight locomotives in 1941 operated a daily average of 116.4 miles, which also was a new high record. The average daily

(Continued on next left-hand page)

"The Freight Train provides the circulation that means Life To The Nation"



C & O 2-6-6-6 "Allegheny Type" locomotive built by Lima Locomotive Works, Inc.

Now, more than ever, the continuous hauling of heavier freight at higher speeds is of vital importance to the preservation of our American way of life.

The railroads of America have brought the handling of freight to a point of unprecedented efficiency. Over the past two decades average freight-train speed has increased 45 per cent, freight-car capacity has increased from 42 tons to 50, and a day's freight-train run has been almost doubled.

Modern Lima Super-Power Steam Locomotives, as exemplified in the new C & O 2-6-6-6 "Allegheny Type" locomotives now in service, have an important part in this achievement. Because of their greater drawbar horsepower and faster speeds they are helping America to "keep 'em rolling".

LIMA LOCOMOTIVE WORKS, LIMA LOCOMOTIVE WORKS INCORPORATED **INCORPORATED, LIMA, OHIO**

movement of all freight cars, which includes time of cars being loaded and unloaded, was 42.6 miles in 1941, a new high record, and an increase of 65 per cent compared with 1921. Net ton-miles per freight car per day was 795 ton-miles, also a new record. The previous record was established in 1940, with an average of 664 ton-miles per day.

"Fuel efficiency in freight service was never better than in 1941. Despite the increased weight per train and the increase that has taken place in the average speed of trains, the railroads in 1941 averaged 111 lb. of fuel for the movement one mile of 1,000 tons of freight and equipment. This average has never before been attained. For each pound of fuel used in freight service in 1941, the railroads hauled nine tons of freight and equipment one mile compared with 6⅛ tons in 1921, or an increase of 46.3 per cent.

"Railroads on January 1, 1941, had 108,972 freight cars in need of repair or 6.8 per cent of ownership. On January 1, 1942, there were 62,200 or 3.7 per cent, which up to that time was the smallest number on record. Since then, this number has been further reduced with the result that on February 1, 1942, there were 60,869 or 3.6 per cent, which is a new low record."

Alco's War Production Well Ahead of Schedule

In a brief ceremony on April 20 held on the site where, one year ago, the American Locomotive Company delivered the first medium tank built by private industry, Duncan W. Fraser, president, told 7,000 employees that the company's current tank production was far ahead of its contract requirements. Observance of the anniversary, held during the noon hour at the plant, which is on a 24-hour production schedule, included the presentation of one-year service stripes to employees who aided in solving the early problems in tank production.

Explaining that the company's participation in war production is not limited to tanks but includes also gun carriages, fragmentation bombs, Diesel engines for the Navy, shells and various other items in addition to locomotives, Mr. Fraser reported that production of these items was also ahead of schedule.

Equipment Purchasing and Modernization Program

Atlantic & North Carolina.—The A. & N. C. has asked the Interstate Commerce Commission to approve a loan to it by the State of North Carolina in the amount of $45,000, the proceeds to be used to purchase four additional locomotives. The note will be retired in five equal annual installments of $9,000, the first to be payable one year after the date of the note, and one installment each year thereafter.

Chicago & North Western.—A $46,000,000 program, devoted primarily to the maintenance of the railroad plant for the war effort, will be undertaken by the Chicago & North Western in 1942. Of this total, approximately $17,600,000 will go for the maintenance and improvement of existing equipment and $10,275,000 for the purchase of new freight equipment. Included in the purchases are 3,375 freight cars and 20 Diesel-switching locomotives, orders for which were placed last year. In addition, existing freight equipment not in use will be remodeled to provide additional units.

Special emphasis is being placed on motive power this year to increase utilization and availability. Fifty stokers are being installed in two classes of steam locomotives, power reverse gears in more than 100 locomotives and integral cast-steel cylinders to replace cast-iron cylinders on eleven steam power units. In addition, other major mechanical improvements to motive power are being made.

Chicago, Milwaukee, St. Paul & Pacific.—Division 4 of the Interstate Commerce Commission has modified its certificate and order in Finance Docket No. 13216 so as to show that the Milwaukee will purchase six coaches instead of the six parlor cars already authorized. The supplemental application explained that the company has been unable to get priorities on the materials for the parlor cars but feels that it can get them on the coaches. It also declared that the cost of the coaches will be approximately the same as that of the parlor cars, or about $240,000. The original amount of the equipment trust which was authorized early last year was $3,120,000.

The Elgin, Joliet & Eastern.—The E. J. & E. is reported to be considering the acquisition of new freight cars.

Great Northern.—Directors of the Great Northern have authorized the expenditure of $3,500,000 for the purchase of 1,000 ore cars of 75-tons capacity.

International-Great Northern.—The trustee of the Missouri Pacific has asked the commission for authority to permit the International-Great Northern to assume liability for $630,000 of equipment trust certificates, maturing in 10 equal annual installments of $63,000 on April 15 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as a part of the purchase price of new equipment costing a total of $1,062,886 and consisting of 100 50-ton, 40 ft. 6 in. all-steel box cars; 200 50-ton, 45 ft. all-steel low side flat bottom gondola cars; and 50 50-ton, 50 ft. all-steel flat cars.

The Lehigh & New England.—The L. & N. E. was erroneously reported to be considering the purchase of new freight cars in the April, *Railway Mechanical Engineer.*

Missouri-Illinois.—The trustee of the Missouri Pacific has asked the commission for authority to permit the Missouri-Illinois to assume liability for $390,000 of equipment trust certificates, maturing in five equal annual installments of $78,000 on April 15 in each of the years from 1943 to 1947, inclusive. The proceeds will be used as a part of the purchase price of new equipment costing a total of $657,406 and consisting of 100 50-ton, 40 ft. 6 in. all-steel box cars; 50 50-ton, 29 ft. 3 in. all-steel covered hopper cars; and 50 50-ton, 45 ft. all-steel low side flat bottom gondola cars.

Missouri Pacific.—This company has asked the Interstate Commerce Commission for authority to assume liability for $2,240,000 of equipment trust certificates maturing in 10 equal annual installments of $224,000 on April 15 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $3,749,844 and consisting of 750 50-ton, 40 ft. 6 in. all-steel box cars; 200 50-ton, 50 ft. 6 in. all-steel box cars; 50 50-ton, 50 ft. 6 in. all-steel box cars, equipped with high-speed trucks for passenger service; 50 70-ton, 65 ft. all-steel mill type gondola cars; and 50 50-ton, 50 ft. all-steel flat cars.

St. Louis, Brownsville & Mexico.—The trustee of the Missouri Pacific has asked the commission for authority to permit the St. Louis, Brownsville & Mexico to assume liability for $1,290,000 of equipment trust certificates maturing in 10 equal annual installments of $129,000 on April 15 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as a part of the purchase price of new equipment costing a total of $2,150,551 and consisting of 250 50-ton, 40 ft. 6 in. all-steel box cars; 400 50-ton, 45 ft. steel low side flat bottom gondola cars; and 50 50-ton, 50 ft. all-steel flat cars.

Southern Pacific.—Among the 1942 improvements being made by the Southern Pacific are a four-stall addition to the enginehouse at Eugene, Ore., the erection of a blacksmith and tinsmith shop at Brooklyn, Ore. The latter is of framed timber construction, 80 ft. by 120 ft., covered with galvanized corrugated metal, replacing outmoded smaller buildings used for like purposes.

G.E. Develops Films for Training Welders

The first attempt to use motion pictures as an aid in the training of arc-welding operators has been announced by the General Electric Company, Schenectady, N. Y. A series of six films is planned; the first has been completed and is available to interested organizations; others will be released as soon as they have been completed. The film which is now ready for distribution covers the fundamentals of good welding practice, including the factors of current setting, angle of electrode, arc length and speed of travel. The reel is made in color and is partly animated to bring out clearly the more important points involved.

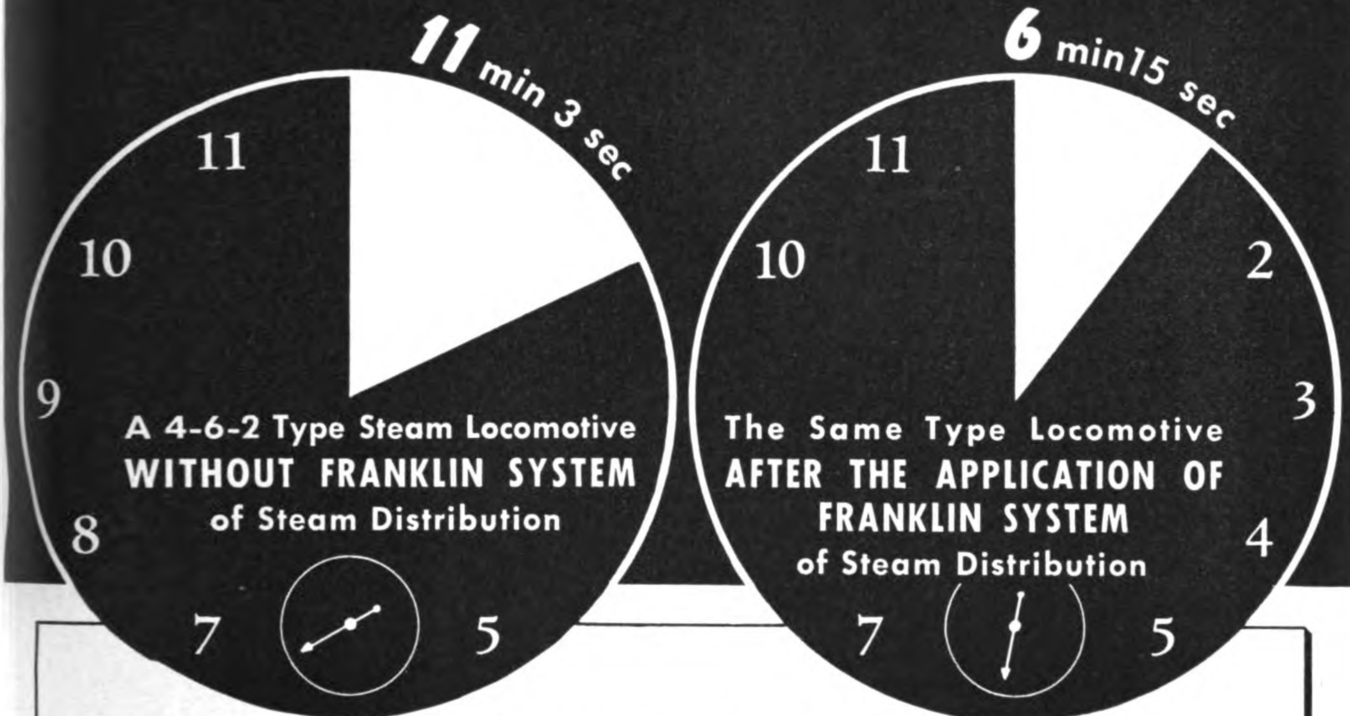
12,787 Air-Conditioned Cars

Class I railroads and the Pullman Company had 12,787 air-conditioned passenger cars in operation on January 1, according to the Association of American Railroads. This was an increase of 587 compared with the number of air-conditioned passenger cars on January 1, 1941, at which time there were 12,200 passenger cars so equipped.

Of the total number of such cars, Class I roads on January 1, had 7,523 an increase of 562 compared with the same date last year. The Pullman Company had 5,264 air-conditioned passenger cars in operation, or an increase of 25 compared with January 1, 1941.

(*Turn to next left-hand page*)

BACK TO ROAD SPEED IN HALF THE TIME



Time Required To Accelerate a 1,000 Ton Train From 40 mph To 75 mph on Tangent Level Track

The time required to get back to road speed after slow downs is dependent upon the power available for acceleration. The increased horsepower resulting from the Franklin System of Steam Distribution gives a higher margin of power to accelerate rapidly. It does this by releasing the latent power that has heretofore been unavailable due to the limitations of the piston valve. This greater power at higher speeds keeps trains on schedule.

FRANKLIN RAILWAY SUPPLY COMPANY, INC. NEW YORK CHICAGO

***In Canada:* FRANKLIN RAILWAY SUPPLY COMPANY, LIMITED, MONTREAL**

Supply Trade Notes

Hynes Sparks has been appointed vice-president in charge of railway sales of the Symington-Gould Corporation. He was formerly manager of eastern sales of Symington-Gould.

◆

Howard W. Broecker has been appointed assistant district manager in the Chicago district selling Aristoloy alloy and Coppco tool steels for the Copperweld Steel Company. Mr. Broecker was previously associated in the Chicago district with the Youngstown Sheet & Tube Company, and with the Interstate Iron & Steel Company.

◆

O. C. Duryea Corporation.—*Charles E. Miller* has been elected vice-president of the O. C. Duryea Corporation, with headquarters at Chicago. *James A. Farquharson,* district representative with headquarters at Washington, D. C., has also been appointed a vice-president.

◆

Bullard Company.—*Edward Payson Bullard, III,* has been elected vice-president in charge of manufacturing of the Bullard Company, makers of machine tools at Bridgeport, Conn. *John A. Bullard,* son

Edward Payson Bullard, III

of the late A. H. Bullard, who was treasurer of the company, and *J. W. C. Bullard, Jr.,* whose father is vice-president in charge of research, have been elected to the board of directors.

E. P. Bullard, III, whose father is president of the firm, was graduated from Yale University in 1932 and attended the Harvard School of Business Administration. He is the designer of the Bullard cut master vertical turret lathe. He developed a descaling machine for the Bullard-Dunn metal-cleaning process, and has developed and designed many tools for the company and its customers.

John A. Bullard, sales engineer for the company, is a graduate of Swarthmore College. At first associated with the Carpenter Steel Company at Reading, Pa., and the Billings & Spencer Co. at Hartford, Conn., he has been with the Bullard Company for 11 years.

J. W. C. Bullard, Jr., who graduated from Lehigh University, is on the staff of the purchasing department.

◆

E. A. Preston has been appointed mechanical engineer of the Wilson Engineering Corporation, Chicago, succeeding J. M. Lammedee, deceased. Mr. Preston received a high-school education. He served a machinist apprenticeship with the Hess Heating & Ventilating Co., and later entered the engineering and drafting department of the Stegeman Motor Car Com-

E. A. Preston

pany, and subsequently was connected with the Fabricated Ship Company in design and construction of deck machinery and steam auxiliaries. Following Naval enlistment for the duration of World War I. Mr. Preston was employed at Newport News Navy Yard and the Bailey Blowers Company until August, 1924, when he became mechanical engineer for the D. J. Murray Manufacturing Company, engaged in the design and construction of gas washers for steel mills, special machinery for paper mills, and unit heaters for railroad engine terminal and shop service.

Navy "E" Awards

The Navy "E" pennant was awarded to the *Ardco Manufacturing Company* in North Bergen, N. J., on March 26; to the *Electric Storage Battery Company* in Philadelphia, Pa., on March 28; to the *American Car and Foundry Company's* Wilmington, Del., plant on April 2; to the New Bedford Division of *Revere Copper and Brass Incorporated* on April 20, and to the *Carnegie-Illinois Steel Corporation* on April 23. This coveted emblem, in the form of a blue flag upon which appears a navy anchor and the letter "E," is awarded by the United States Navy for production achievement. Employees of all companies receiving this award are also given the right to wear the All-Navy "E" insignia as evidence of their accomplishment in production.

American Steel Foundries.—W. H. Baselt, chief mechanical engineer of the American Steel Foundries, has been appointed mechanical assistant to the vice-president and has been succeeded by *R. B. Cottrell,* assistant chief mechanical engineer, who in turn has been succeeded by *R. G. Aurien,* mechanical engineer of brakes.

◆

Alexander M. Hamilton has been elected executive vice-president in executive control of the Canadian Tank Arsenal, operated by the Montreal Locomotive Works, Ltd., an affiliate of the American Locomotive Company. He will devote his entire time to the production of combat tanks, working in co-operation with B. D. Beamish, director general of the tank production branch of the department of munitions and supply of the Canadian government.

◆

Ashton Valve Company.—*Joseph W. Motherwell,* formerly vice-president, treasurer and general manager, has been elected president of the Ashton Valve Company. Mr. Motherwell will continue to hold the office of treasurer. *Henry B. Nickerson,*

Joseph W. Motherwell

vice-president, has been elected vice-president and general manager, to succeed Mr. Motherwell.

Mr. Motherwell began his career in 1888 as an apprentice with the Troy Laundry Machine Company, remaining as machinist and tool maker until 1890. He served as machinist and engine erector for the H. W. Caldwell Company from 1891 to 1893 and as erector, field engineer and railroad department salesman for Fairbanks, Morse & Co. from 1893 to 1904. He joined the Ashton Valve Company in 1904, serving as a salesman until 1911 and as a vice-president and manager of the railroad department from 1911 to 1921. In the latter year he was elected vice-president, treasurer and general manager.

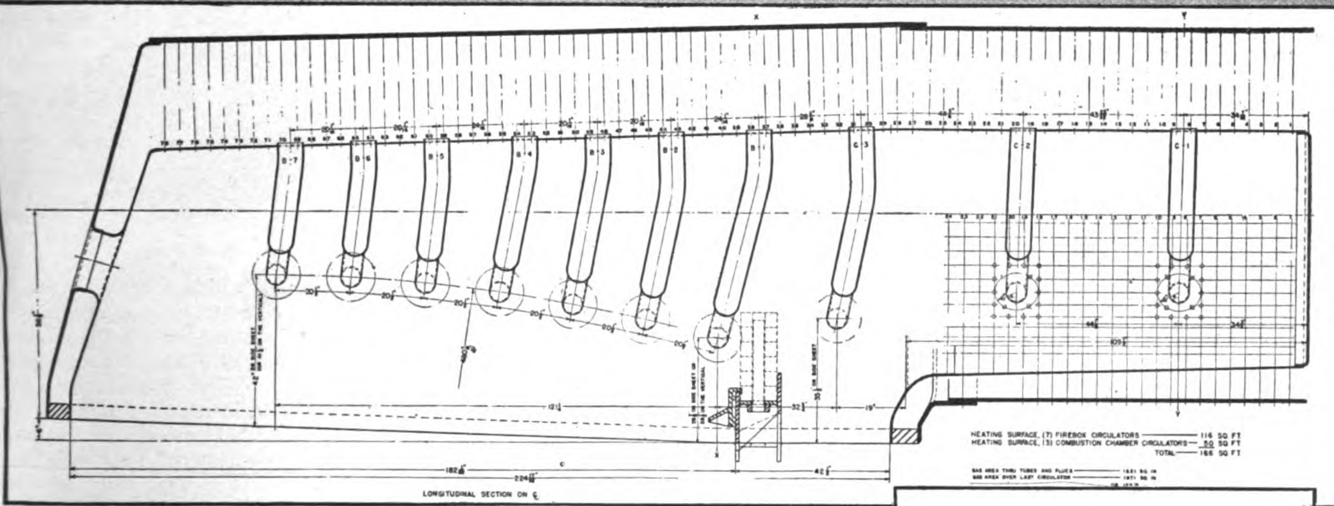
Mr. Nickerson, during his earlier career, had been associated with the American Steam Gage Company from 1898 to 1923; with the American Schaeffer & Budenberg

(*Continued on next left-hand page*)

BETTER COMBUSTION

for modern freight locomotives through the application of

SECURITY CIRCULATORS



The problem of supporting brick arches of unusual length, which is the result of the demand for increased boiler horsepower, has been effectively solved by the Security Circulator, a development of the American Arch Company.

In addition to achieving the original object of improved support many other benefits have accrued. The reduction of honeycombing and cinder cutting lessens the maintenance of the boiler. The Security Circulator itself is extremely low in maintenance costs.

On the Security Circulators that have been installed during the last six years, performance has been thoroughly proved by over 10,000,000 locomotive miles of service.

Improved Arch Support for the largest fireboxes

★

Adapted to any type of locomotive

★

Reduced honeycombing, flue plugging and cinder cutting

★

Improved circulation in side water legs

AMERICAN ARCH CO., INC.

NEW YORK • CHICAGO **SECURITY CIRCULATOR DIVISION**

Corporation from 1923 to 1928; and with the Consolidated Ashcroft Hancock Company from 1928 to 1931. He joined the Ashton Valve Company as vice-president in charge of sales in 1931.

Henry B. Nickerson

◆

J. G. BRILL COMPANY.—*Leslie E. Hess* has been elected president of the J. G. Brill Company to succeed *Charles J. Hardy*, who has been appointed chairman of the board. Because of his other corporate connections, Mr. Hardy deemed it in the best interests of the company that he be relieved of certain of the duties imposed on him as president. The board of directors, therefore, created the office of chairman of the board and elected Mr. Hardy to that office. He will continue as chairman of the company's executive committee.

◆

J. H. WILLIAMS & CO.—*A. Donnally Armitage*, formerly vice-president, has been elected president of J. H. Williams & Co., to succeed J. Harvey Williams, deceased. *E. J. Wilcox*, formerly sales manager of the stock products division, has been elected vice-president in charge of stock products sales; *Willard C. Kress*, formerly works manager, has been elected vice-president in charge of all manufacturing; and *Hugh Aikman* and *Clark M. Fleming* re-elected to the positions of secretary and treasurer, respectively. Mr. Fleming will fill the vacancy in the company's board of directors caused by Mr. Williams' death.

JOSEPH T. WRIGHT has been appointed manager of the compressor and tool division of the Holyoke, Mass., plant of the Worthington Pump & Machinery Corporation.

◆

ALLEGHENY LUDLUM STEEL CORPORATION.—W. A. Givens, vice-president in charge of manufacturing at Pittsburgh, Pa., has been elected to the newly created position of executive vice-president and has been succeeded by Frank B. Lounsberry.

Obituary

FRED J. MAEURER, for the past 13 years associated as a specialist with the applied engineering department, Air Reduction Sales Company, died April 13. Mr. Maeurer was associated with the oxyacetylene industry for nearly 33 years, having joined the Davis-Bournonville Company, Jersey City, N. J., in 1909 and continued therein when that company was acquired by Airco in 1922.

◆

DAVID M. CRAIG, for many years an official of the Koppers Company, died suddenly in his office on March 26. He was 67 years old. Mr. Craig, a graduate of Princeton University, was employed for several years by the Pittsburgh & Western and was also associated with the Pennsylvania as an engineer for 15 years. He joined the Koppers organization as engineer in the construction department in 1915.

◆

GEORGE L. NORRIS, chief metallurgist of the Vanadium Corporation of America, died at Roosevelt Hospital, New York, on April 13. He was 76 years of age. Mr. Norris was one of the pioneers in the development and application of vanadium. He joined the American Vanadium Company in 1909 and remained with the company when it became the Vanadium Corporation of America.

◆

CARL A. W. BRANDT, chief engineer of The Superheater Company and a former railroad engineer, died on April 25. Mr. Brandt was born in Stockholm, Sweden, on January 28, 1881, and received a degree in mechanical engineering from the Technical College of Stockholm in 1899. He was assistant engineer and draftsman on the Government Railway of Sweden in 1900-01 and was associated with the Atlas Locomotive Works in Stockholm in 1902. He then came to the United States and in 1902 entered the employ of the Lake Shore & Michigan Southern (now the New York Central) as a machinist. In 1903 he became a draftsman for the same road at Cleveland, Ohio, and in 1905 was promoted to the position of assistant mechanical engineer at Cleveland. He was appointed mechanical engineer of the Cleveland, Cincinnati, Chicago & St. Louis in 1910. During 1914-15 he was assistant division master mechanic of the Big Four at Indianapolis. In 1916 Mr. Brandt became chief engineer of The Superheater Company, New York, in which capacity he had charge of the development and design of locomotive superheaters and feedwater heaters, and similar apparatus for stationary plants. Mr. Brandt was a member of the New York Railroad Club, the Canadian Railway Club, the Western Railway Club, the Railway Fuel and Traveling Engineers' Association, the Master Boiler Makers' Association, and the American Society of Mechanical Engineers. He was the author of "The Design and Proportion of Locomotive Boilers and Superheaters" presented before the Canadian Railway Club in 1928 and "The Locomotive Boiler" presented before the A.S.M.E. in 1939. For the latter, in 1941, he was awarded the A.S.M.E Melville Medal "for original engineering work."

C. A. Brandt

Personal Mention

General

P. B. CARRIER has been appointed supervisor of motor equipment on the Erie at Susquehanna, Pa.

F. S. TINDER, shop superintendent on the Virginian at Princeton, W. Va., has been appointed assistant superintendent of motive power, with headquarters at Princeton.

D. J. COON has been appointed mechanical supervisor of the New York, Chicago & St. Louis. Mr. Coon, whose headquarters will be at Cleveland, Ohio, will be in charge of locomotive operation and fuel supervision. Mr. Coon was formerly traveling engineer, Advisory Mechanical Committee.

W. J. TAPP, fuel supervisor of the Denver & Rio Grande Western at Denver, Colo., has been appointed to the newly created position of superintendent of fuel conservation at Denver.

I. R. PEASE, assistant to superintendent motive power on the New York, Ontario & Western at Middletown, N. Y., has been promoted to the position of assistant superintendent motive power with the same headquarters.

J. R. GROVE, master mechanic of the Washington Terminal Company, has become assistant superintendent of motive power on the Lehigh Valley at Bethlehem, Pa.

ARTHUR W. BYRON has been appointed superintendent of motive power of the Eastern Pennsylvania and the Central Pennsylvania divisions of the Pennsylvania, with headquarters at Harrisburg, Pa., as noted in the April issue. The position of superintendent of motive power of those divisions was formerly occupied by M. R. Reed, who was furloughed in 1938 to become a member of the Railroad Retirement

Board in Washington, D. C. Mr. Byron has been on leave of absence since June 1, 1941, when he became affiliated with the Office of Production Management (now the War Production Board). He was born in Buffalo, N. Y., on January 3, 1880, and after attending grammar and high schools in that city, completed an engineering course at the Y. M. C. A. evening school and a course in business training at the Buffalo College of Commerce. Prior to his entering the service of the Pennsylvania he worked for two and one-half years with the Lake Shore & Michigan Southern (now New York Central) as a machinist apprentice at Buffalo, where he was schooled in the air-brake department, erecting and machine shops, and the enginehouse. Mr. Byron entered the service of the Pennsylvania in December, 1899, as a draftsman in the office of the superintendent of motive power at Buffalo and advanced through various supervisory positions in that department to the position of superintendent of motive power of the Central Pennsylvania division at Williamsport, Pa. While he was master mechanic of the Philadelphia Terminal division from July 16, 1938, to October 16, 1939, he also had general supervision and jurisdiction over the motive power department of the Pennsylvania-Reading Seashore Lines. During

Arthur W. Byron

World War I, Mr. Byron was furloughed by the Pennsylvania from August 21, 1917, to December 13, 1920, for military duty, serving with the A. E. F. first as superintendent of motive power of Military Railways in the Zone of Advance and thereafter as assistant general superintendent of motive power, in charge of all railway mechanical activities, Zone of Advance. In 1920, he was assigned to duty with the U. S. Liquidation Commission and was honorably discharged from service in November, 1920, with the rank of Major.

Edwin E. Hinchman, superintendent of the Los Angeles, Calif., general shops of the Southern Pacific who has been appointed assistant superintendent of motive power with headquarters at Sacramento, Calif., as noted in the April issue, was born at San Francisco, Calif., on February 17, 1894, and entered railway service on September 3, 1912, as a draftsman in the office of the general superintendent of motive power of the Southern Pacific at San Francisco. On May 1, 1926, he was appointed dynamometer engineer and on June 16, 1936, was appointed assistant master mechanic at Roseville, Calif., later being transferred to West Oakland, Calif. On April 1, 1939, Mr. Hinchman was promoted to master mechanic at Bakersfield, Calif., and on July 1, 1941, was advanced to superintendent of the Los Angeles general shops.

Master Mechanics and Road Foremen

J. A. Long, Jr., has been appointed master mechanic of the Washington Terminal Company.

J. G. Danneberg has been appointed master mechanic on the Atchison, Topeka & Santa Fe at Arkansas City, Kan.

J. W. Atkinson, master mechanic on the Atchison, Topeka & Santa Fe at Arkansas City, Kan., has been transferred to Shopton (Ft. Madison), Iowa.

G. L. Fisher, master mechanic on the Erie, with headquarters at Buffalo, N. Y., has been transferred to Meadville, Pa., succeeding T. F. Gorman, deceased.

A. B. Atkinson, general foreman on the Illinois Central at Centralia, Ill., has been appointed master mechanic, with headquarters at Memphis, Tenn.

J. A. Tobin, master mechanic on the Union Pacific at Cheyenne, Wyo., has been appointed assistant master mechanic of the Wyoming division.

A. R. Snyder, master mechanic of the Nebraska division on the Union Pacific at Council Bluffs, Iowa, has been transferred to Cheyenne, Wyo.

G. O. Love, general locomotive foreman on the Union Pacific, has been promoted to master mechanic of the Nebraska division, with headquarters at Council Bluffs, Iowa.

Walter Medlock, general foreman on the Denver & Rio Grande Western at Grand Junction, Colo., has been appointed master mechanic, with headquarters at Grand Junction.

F. W. Kubler has been appointed master mechanic of the Los Angeles division of the Southern Pacific, with headquarters at Los Angeles, Calif., succeeding F. P. McDonald, deceased.

R. B. McLean, master mechanic on the Denver & Rio Grande Western at Grand Junction, Colo., has been transferred to the Pueblo division, with headquarters at the Burnham shops, Denver, Colo.

C. K. James, master mechanic of motor equipment on the Erie at Susquehanna, Pa., has been appointed master mechanic at Buffalo, N. Y. The position of master mechanic of motive equipment has been abolished.

L. R. Haase, district boiler inspector of the Baltimore & Ohio, with headquarters at Baltimore, Md., has been appointed master mechanic of the Baltimore & Ohio Chicago Terminal, with headquarters at Chicago. Mr. Haase entered the service of the B. & O. as a messenger in 1919 and in 1920 became a machinist apprentice at the Mt. Clare shops. He subsequently became a machinist and in 1926 was appointed draftsman on locomotive, car and shop work, meanwhile having studied mechanical engineering at Polytechnic In-

L. R. Haase

stitute night school for six years. He later specialized in boiler design and construction. On November 1, 1935, he became district boiler inspector, Pennsylvania district, with headquarters at Pittsburgh, Pa., and in December, 1937, was transferred to Baltimore.

E. H. Holloway, mechanical assistant in the office of the superintendent motive power of the Central of Georgia, at Savannah, Ga., has been appointed supervisor of Diesel maintenance, reporting to T. A. Johnson, master mechanic at Macon, Ga.

Shop and Enginehouse

K. D. Read has been appointed assistant superintendent of the locomotive shops on the New York Central (Big Four) at Beech Grove, Ind.

William H. Foster, master mechanic on the Virginian at Princeton, W. Va., has become shop superintendent with headquarters at Princeton.

L. B. George, division master mechanic on the Canadian Pacific at Lethbridge, Alta., has been appointed works manager of the Weston shops, Winnipeg, Man., succeeding John Lee, deceased.

W. P. Gilford, enginehouse foreman on the Western Maryland at Keyser, W. Va., has been promoted to the position of general foreman at Port Covington, Baltimore, Md.

J. J. Meyers, general locomotive foreman on the New York, Ontario & Western at Middletown, N. Y., has been appointed supervisor locomotive maintenance at Middletown.

G. W. Birk, assistant superintendent of the locomotive shops on the New York Central (Big Four) at Beech Grove, Ind., has been appointed superintendent of those shops.

(Turn to second left-hand page)

50% REDUC

More Tonnage
Faster Schedules

GENERAL MOTORS
LOCOMOTIVES

WHO SERVES THE RAIL

Meeting the Challenge

AMERICAN railroads are today faced with the greatest transporta-tion responsibility in our nation's history, that of moving the fast growing army of men, materials and supplies with safety and dispatch.

In meeting this challenge, General Motors Diesel locomotives in all classes of service are playing an important part, not only in promoting the conservation of vital war materials, such as metals and fuel, but many other operating advantages and economies. In this program the GM 5400 Hp. Diesel freight locomotives are particularly outstanding as evidenced by their ability to:

(a) Effect savings in train miles as much as 50 per cent, making one Diesel train mile the equivalent of two steam train miles.

(b) Release for other important service as many as five heavy steam locomotives for each Diesel locomotive operated.

(c) Increase the traffic hauling and time capacity; also availability for service.

(d) Provide faster schedules by eliminating many service delays now required for steam locomotives.

(e) Increase carrying capacity of existing track facilities without expensive rail replacements and rebuilding of bridge structures . . . this due to even weight distribution and low axle load of Diesels.

ELECTRO-MO

GENERAL MOTORS

TION IN TRAIN MILES

DADS—SERVES AMERICA

Conservation of War Materials

THE CONSERVATION of vital and strategic war materials made possible by the construction of Diesels instead of steam locomotives is clearly shown in the following comparisons:

(a) **192 TONS** of materials in the form of two 600 Hp. Diesel switchers will do the work of **420 TONS** of such materials in the form of three 6-wheel steam switchers.

(b) **240 TONS** of materials in the form of two 1000 Hp. Diesel switchers will do the work of **495 TONS** of such materials in the form of three 8-wheel steam switchers.

(c) **585 TONS** of materials in the form of two 4000 Hp. Diesel passenger locomotives will do the work of **1250 TONS** of such materials in the form of five modern steam passenger locomotives.

(d) **415 TONS** of materials in the form of one 5400 Hp. Diesel freight locomotive will generally do the work of **1200 TONS** of such materials in the form of four 4-8-4 modern steam freight locomotives, or **900 TONS** in the form of two Mallet steam locomotives.

MODERNIZE TO MOBILIZE WITH GM DIESELS

VE DIVISION

LA GRANGE, ILLINOIS, U.S.A.

J. W. ANDERSON, general foreman of the Chicago & North Western at Winona, Minn., has retired.

H. W. CRAIG has been appointed supervisor of apprentices of the Erie, with headquarters at Cleveland, Ohio, succeeding L. A. Hartley, furloughed to accept a commission in the United States Army.

JAMES BEAN, who has become superintendent of shops of the Southern Pacific, at Los Angeles, Calif., as noted in the April issue, was born on August 23, 1895, at San Jose, Calif. Mr. Bean was graduated from the San Jose high school in 1915. He received an AB degree in mechanical engineering from Stanford University in June, 1922. In November, 1918,

James Bean

he had received the rank of ensign from the U. S. Navy Hydroplane school in New London, Conn. On August 6, 1923, he entered the service of the Southern Pacific as a draftsman in the office of mechanical engineer in San Francisco, Calif. He was appointed assistant engineer of tests and chief draftsman of the Los Angeles general shops in August, 1927, and superintendent of those shops on March 1, 1942.

C. C. ROBINSON has been appointed general foreman of the Chicago & North Western, with headquarters at Antigo, Wis.

F. BAUER, superintendent of the locomotive shops on the New York Central (Big Four) at Beech Grove, Ind., has retired from active service.

Car Department

H. A. BURBRIDGE has been appointed acting foreman on the Canadian National at Bathurst, N. B.

W. D. ELLIOTT has become car foreman of the Canadian National at Brick Shop, Moncton, N. B.

A. R. GREEN, general car inspector on the New York, Ontario & Western at Middletown, N. Y., has been appointed supervisor car maintenance at Middletown.

HARRY WILBUR has become auxiliary and car foreman on the Canadian National at Brick Shop, Moncton, N. B.

FRANK MARSH has become acting assistant foreman in the upholstery department, passenger car paint shop, at Moncton, N. B.

O. M. HASTINGS, general car foreman on the New York, Ontario & Western at Middletown, N. Y., has been appointed supervisor car shops with the same headquarters.

O. H. CLARK, general car inspector of the Gulf Coast Lines and the International-Great Northern (both parts of the Missouri Pacific system), with headquarters at Houston, Tex., has been appointed assistant superintendent of the car department of the Missouri Pacific Lines, with headquarters at St. Louis, Mo., succeeding F. E. Cheshire, who has been called to military service.

Purchasing and Stores

JOSEPH C. MCCAUGHAN, district storekeeper on the Chesapeake & Ohio at Richmond, Va., has been appointed general storekeeper at Huntington, W. Va.

JOSE F. ROMO, general storekeeper of the Mexico North-Western, has been appointed purchasing agent, with headquarters as before at Ciudad Juarez, Chih., a change of title.

J. L. QUARLES, general storekeeper of the Chesapeake & Ohio at Huntington, W. Va., has been appointed superintendent of stores of the Chesapeake & Ohio; the New York, Chicago & St. Louis and the Pere Marquette, with headquarters at Cleveland, Ohio.

Obituary

JAMES J. BARRY, assistant to superintendent motive power of the Norfolk & Western, with headquarters at Roanoke, Va., died on February 11 at the age of 68.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

"HOW WORTHINGTON SERVES INDUSTRY."—Worthington Pump & Machinery Corporation, Harrison, N. J. Eleven-page staple-bound booklet gives a general view of Worthington's service to various industries, including the railroad industry.

◆

JOHNSON BRONZE. — Johnson Bronze Company, 1005 South Mill street, New Castle, Pa. Four-page bulletin descriptive of Johnson universal bronze bar stock.

◆

DIESEL-ELECTRIC LOCOMOTIVES. — Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa. One-hundred-page spiral-bound catalog, in two colors; brief specifications and illustrations of Diesel-electric locomotives of 10 to 80 tons.

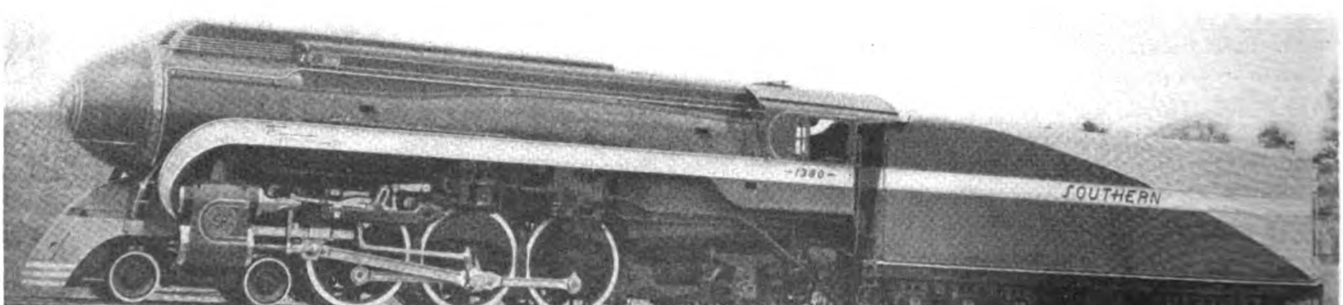
◆

BYERS GENERAL CATALOG, 1942.—A. M. Byers Company, Pittsburgh, Pa. Sixty-two-page spiral-bound catalog of wrought-iron, tubular and hot-rolled products; steel tubular products, and alloy steels.

◆

"HOW ONE COMPANY TACKLES THE WAR PRODUCTION PROBLEM."—Lyon Metal Products, Inc., Aurora, Ill. A step-by-step treatment of how the Lyon company set about to regain lost production, replacing peacetime products with war products.

* * *

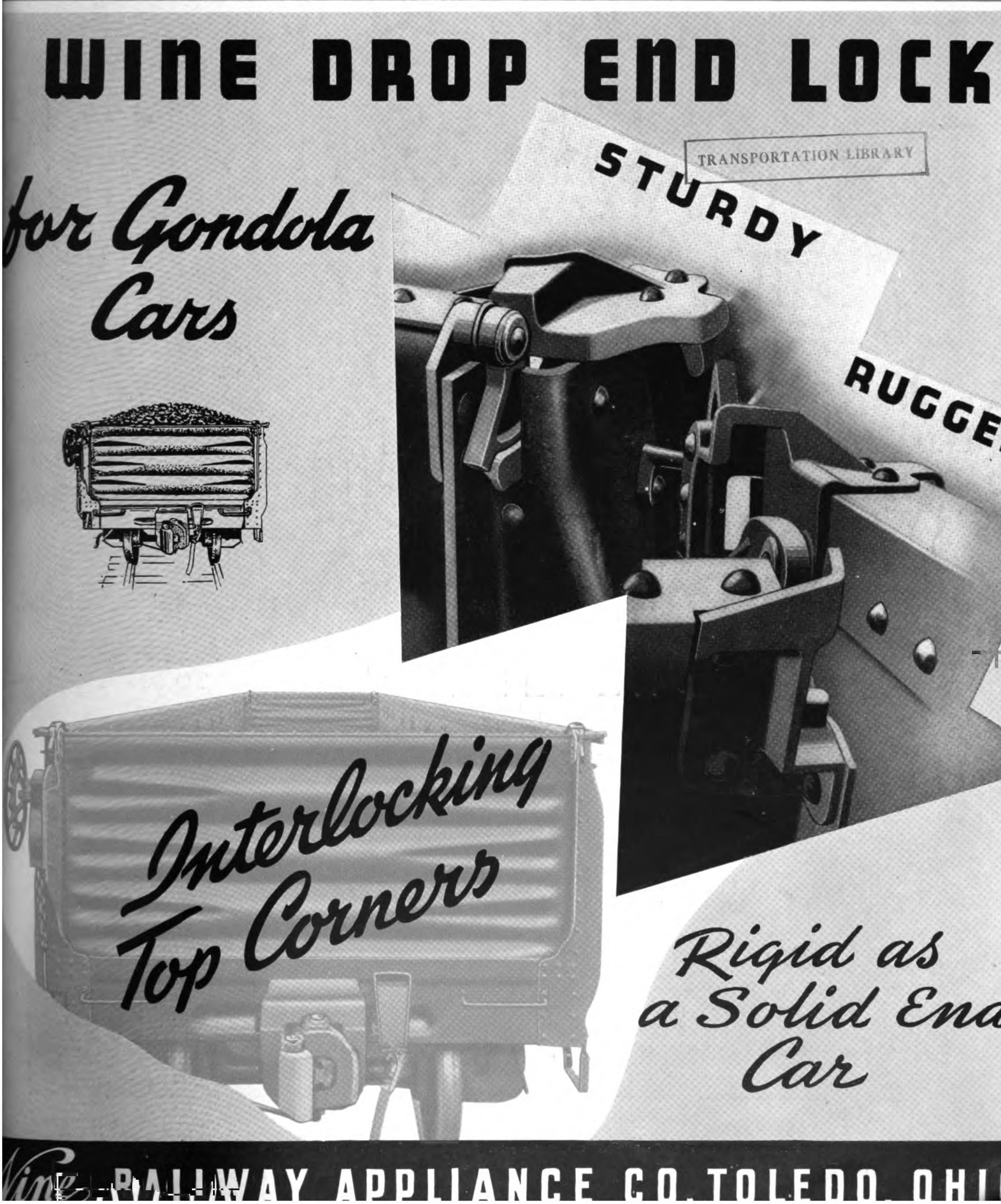


Motive power for the Southern's streamline train, "The Tennessean"

Railway Mechanical Engineer

June 1942

FOUNDED IN 1832



Published monthly by Simmons-Boardman Publishing Corporation. 1309 Noble Street, Philadelphia, Pa. Entered as second-class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, $3.00 for one year, U. S. and Canada. Single copies 35 cents. Vol. 116, No. 6

RAILWAY MECHANICAL ENGINEER

Founded in 1832 as the American Rail-Road Journal

With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office.

Volume 116 *No. 6*

JUNE, 1942

General Articles on Welding:

Roy V. Wright
Editor, New York

C. B. Peck
Managing Editor, New York

E. L. Woodward
Western Editor, Chicago

H. C. Wilcox
Associate Editor, New York

J. L. Stover
Associate Editor, New York

Robert E. Thayer
Vice-Pres. and Business Manager, New York

Published on the second day of each month by

Simmons-Boardman Publishing Corporation

1309 Noble street, Philadelphia, Pa. Editorial and Executive Offices: 30 Church street, New York, and 105 West Adams street, Chicago. Branch offices: Terminal Tower, Cleveland; 1081 National Press bldg., Washington, D. C.; 1038 Henry bldg., Seattle, Wash.; 550 Montgomery street, Room 805-806, San Francisco, Calif.; 530 W. Sixth street, Los Angeles, Calif.

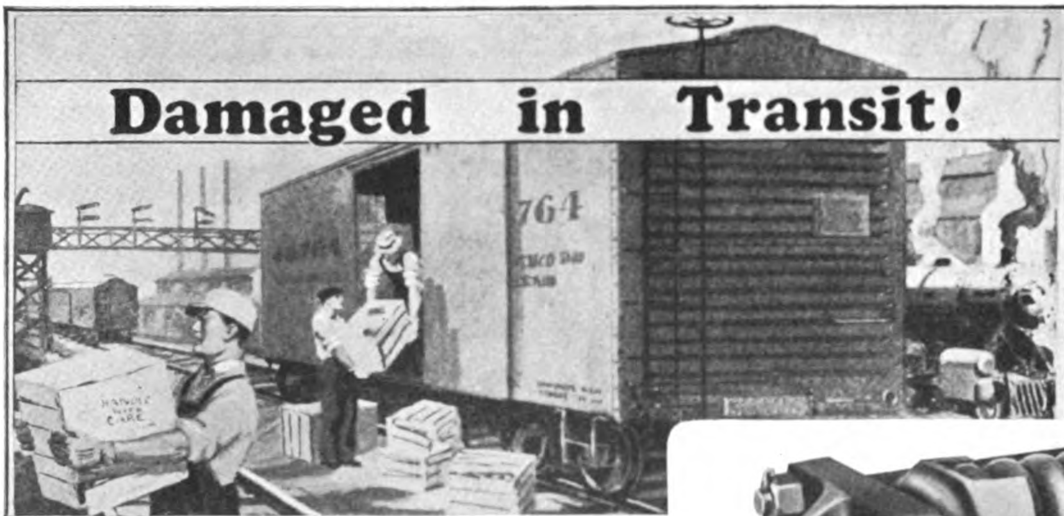
Samuel O. Dunn, *Chairman of Board, Chicago;* Henry Lee, *President, New York;* Roy V. Wright, *Vice-Pres. and Sec., New York;* Frederick H. Thompson, *Vice-Pres., Cleveland;* Elmer T. Howson, *Vice-Pres., Chicago;* Frederick C. Koch, *Vice-Pres., New York;* Robert E. Thayer, *Vice-Pres., New York;* H. A. Morrison, *Vice-Pres., Chicago;* John T. DeMott, *Treas. and Asst. Sec., New York.*

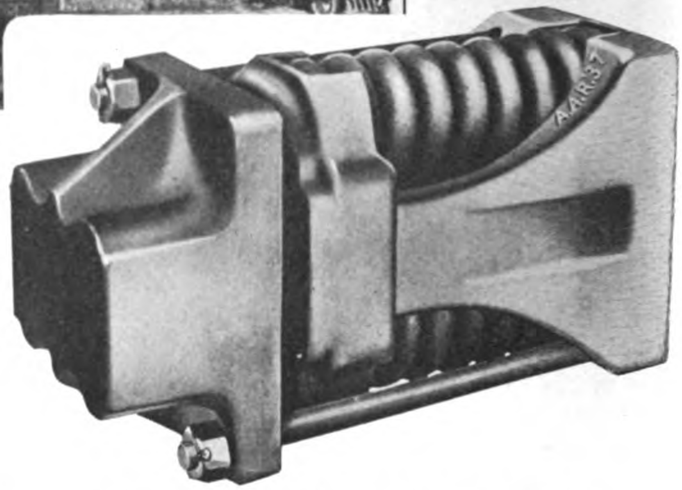
Subscriptions (including, when published, the daily editions of the Railway Age, published in connection with the convention of the Association of American Railroads, Mechanical Division), payable in advance and postage free, United States, U. S. possessions and Canada: 1 year, $3; 2 years, $5. Foreign countries, not including daily editions of the Railway Age: 1 year, $4; 2 years, $7. Single copies, 35 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.), and is indexed by the Industrial Arts Index and also by the Engineering Index Service. Printed in U. S. A.

Editorials:

Welding Equipment and Supplies:





NATIONAL M-17-A DRAFT GEAR
$22\frac{3}{8}''$ long
A.A.R. Approved

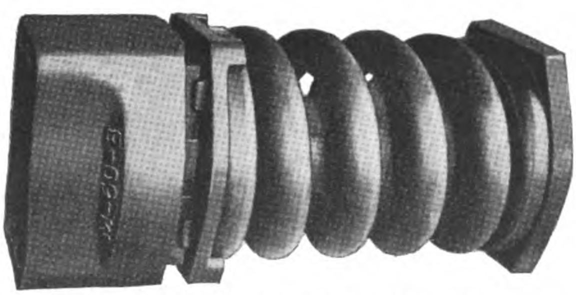
THREE words that cost the railroads money.

Millions of dollars are paid out each year for damage claims, of which a large percentage is due to inadequate draft gear protection.

More powerful engines, longer trains and **higher speeds require greater protection of cars and lading.**

NATIONAL FRICTION DRAFT GEARS

are designed and built to afford this protection.



NATIONAL M-50-B DRAFT GEAR
$20\frac{1}{8}''$ long
A.A.R. Approved

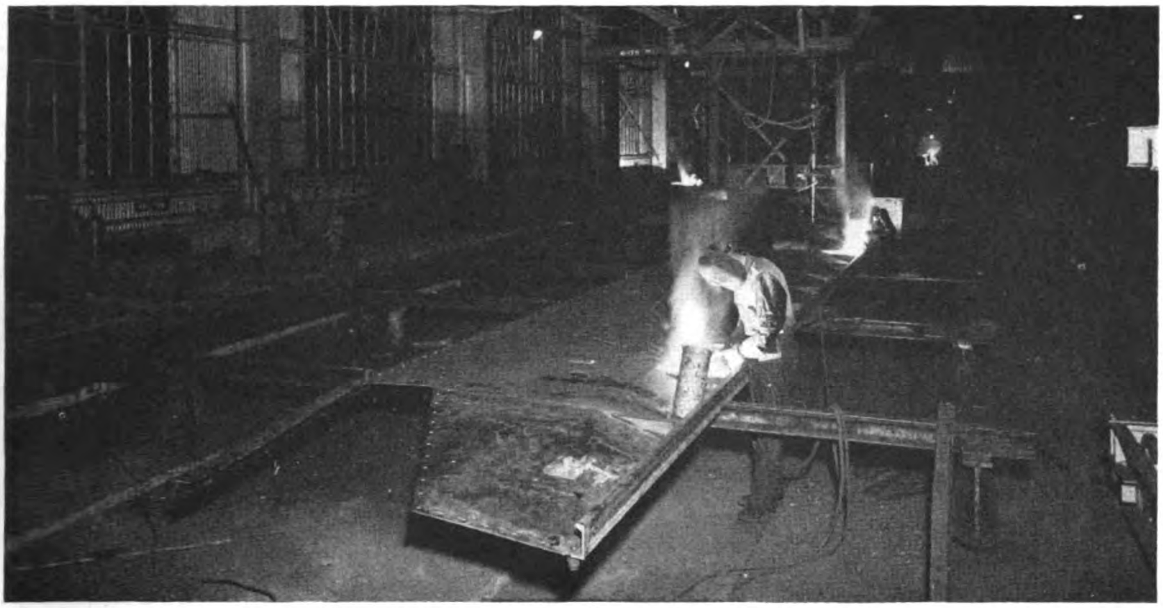
Smooth starting action coupled with high ultimate capacity allows these gears to absorb gradually the heaviest blows with the least shock to equipment.

This more efficient protection of cars and lading not only reduces damage claims, but also shows a noticeable reduction in car maintenance.

NATIONAL MALLEABLE AND STEEL CASTINGS CO.

General Offices: CLEVELAND, OHIO

Sales Offices: New York, Philadelphia, Chicago, St. Louis, San Francisco.
Works: Cleveland, Chicago, Indianapolis, Sharon, Pa., Melrose Park, Ill.



Fabricating a hopper-car side by electric arc welding

The Field for Welding*

By Leland E. Grant†

A survey of the possibilities offered by present techniques for restoring worn or broken parts, salvaging scrap materials, and reducing consumption of critical materials — Their attainment now hindered by opinions formed from obsolete practice—Coated electrodes a big factor in broadening the scope of the art

THE American railroads face three serious problems in their efforts to keep equipment in repair to meet the heavy demands of the present emergency. These problems involve materials, machines, and men. Essential materials, especially metals, are already difficult to obtain and this situation may be expected to grow progressively worse as the use in defense industries increases. A high priority rating may not be of much help if the shortage becomes so serious that there is an insufficient supply for strictly military requirements. Machine tools are in such demand for war work that they are not freely available even for the railroads and in addition many of them require so long in building that if ordered immediately they would not help the situation for some time to come. The shortage of skilled labor is acute as evidenced by the recall of pensioned employees. The railroads must contend with active competition for any skilled labor that is available or may become so through fluctuations in the industries.

Under present conditions, therefore, it is essential to make the best possible use of the materials, men, and machines. Metal parts that can be salvaged, even at a reclamation cost greater than that for the new part, ought not be scrapped. Adoption of methods that will result in a reduction in the amount of processing on machine tools will assist not only in making the best possible use of the tools but also of the skilled mechanics required to operate them. It is apparent that a program which will save material and reduce the amount of machine tool work will not only save the railroads money but will help in keeping the equipment in shape and contribute to the defense of America.

*This article was entered in the *Railway Mechanical Engineer* prize competition on ways in which the mechanical department can secure best results from available facilities and equipment which was announced in the October, 1941, issue.

† Engineer of tests, Chicago, Milwaukee, St. Paul & Pacific, Milwaukee, Wis.

Welding Possibilities

It is the opinion of the author that welding, combined with oxy-acetylene cutting, offers almost limitless possibilities in establishing such a program. The welding torch and cutting torch are two of the most powerful tools ever placed in the hands of workmen. Only imagination and initiative are necessary to develop the tremendous potentialities inherent in them, but before they will come to be used to the maximum possible extent some erroneous impressions about their limitations will have to be corrected. Unfavorable opinions concerning the value and dependability of welds, based probably upon the characteristics of welds made with bare wire, will need to be discarded. New and accurate ideas founded on the accomplishments possible with modern machines and electrodes should replace them.

Supervisors, department heads, and others who share the responsibility for maintaining the splendid performance record of the railroads, need only look to modern ships, aeroplanes, tanks, guns and even the machine tools with which they are very familiar, to see evidence of many successful applications of welding. In the face of such evidence there can be no excuse for not recognizing the possibilities for economy in the mechanical department by more extensive application of welding and cutting. *If all the American railroads were to adopt immediately only those cutting and welding procedures now in successful use in the various railroad shops of the country, the aggregate savings would be enormous.*

One of the most important stumbling blocks preventing the adoption of such a program is the innate characteristic trait of the human mind to resist change. A clear recognition of this strange reluctance to accept new ideas, coupled with a determined effort to overcome it, would quickly lead to an accurate evaluation of welding processes and their possible application to mechanical department problems.

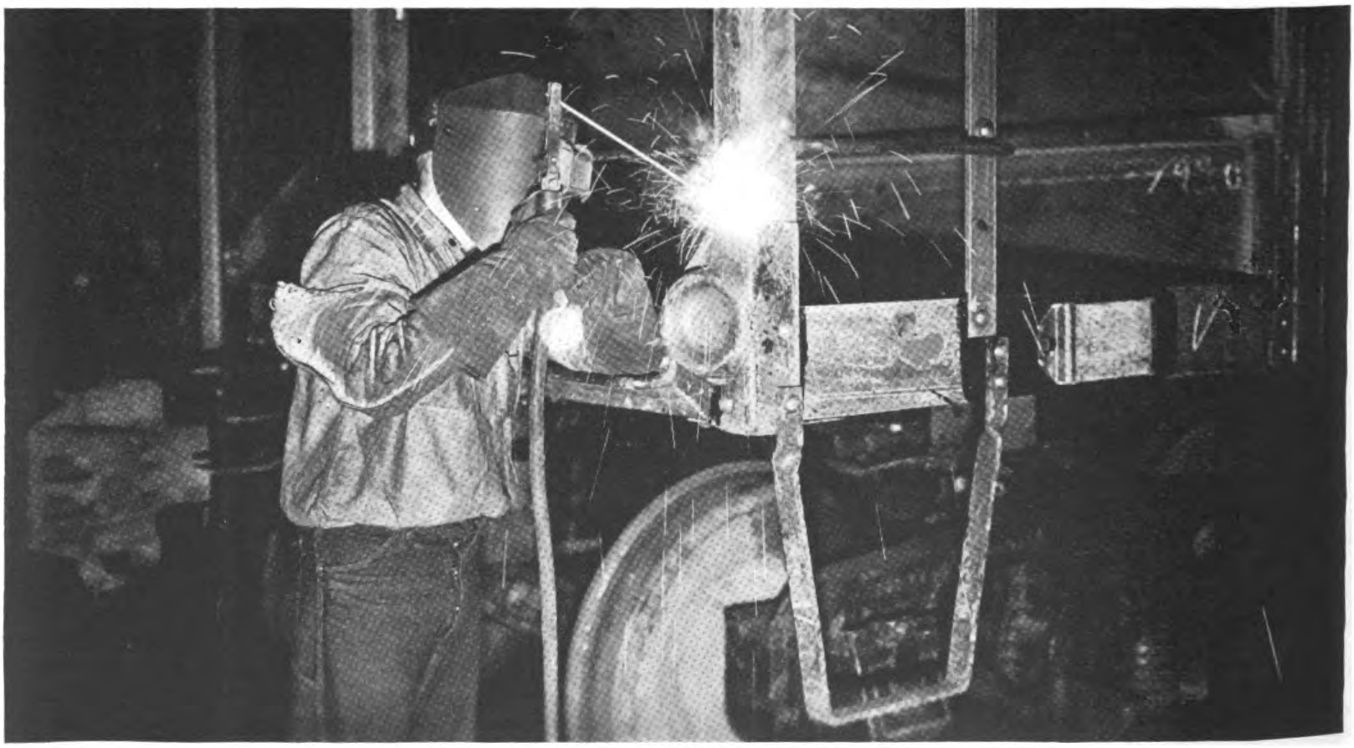
It is not the author's purpose in this paper to list all the various parts that can be welded and to give detailed procedures for so doing. Rather it is desired to show how completely and effectively cutting and welding can serve in overcoming the handicaps in maintenance that have developed or will develop as a result of the current defense program. If a proper appreciation of these methods is attained, applications will follow in due course.

The term welding is intended to include both electric and gas methods. The electric methods will be found the most economical in general but gas welding has definite fields of usefulness. Details of welding and cutting procedures are not included because they are readily obtainable elsewhere. However, some of the general factors pertaining to all welding are discussed, particularly their influence on the success or failure of a welding program. Some of the reasons for failure in the past are explained in order to account for the unjustified poor opinion of welding held by some. The favorable effect of an expanded welding program on the machine tool and skilled labor problem is noted.

Handicapped by Misunderstanding

If the use of welding is to be extended on the railroads it will not do to turn down a proposal arbitrarily just because someone has previously tried it and says, "It can't be done!" Possibly one reason it couldn't be done is because too much was left to the discretion of the operator; but more about this angle later. Also there may have been unfavorable conditions existing when the job was first tried that have changed since. Welding that was not justified for economic reasons when new material was available may, and probably will, appear in an altogether different light now.

On the other hand success may depend upon proper pre-heating, stress relieving, annealing or other heat treatment. Sometimes the use of electrodes producing welds meeting certain physical requirements is a deciding factor. Control of warping by the use of jigs or a definite sequence for making the welds may be essential. Many factors may need to be given consideration but basically this part of a welding program does not differ



Welding on a push-pole pocket

from many other mechanical department problems. It entails that supervisors shall understand what must be done, see that the welders also understand and that they use the best materials and methods indicated.

Sources of Information

There are a number of sources of information that may be used for assistance in new applications and for ideas pertaining to possible applications of welding. The A. A. R. Manual on Welding should be found especially useful for this. It contains detailed descriptions of methods for cutting and welding many metals as well as examples of numerous applications on the railroads. Other sources of information are the Handbook and monthly Journal of the American Welding Society, handbooks published by manufacturers of welding machines and supplies, bulletins of some steel companies, and articles that appear in the *Railway Mechanical Engineer.*

Frequently it is possible to obtain valuable advice and assistance from the service men of concerns furnishing welding equipment. Best of all it will frequently be found possible to see how some other railroad is doing the particular job in which one is interested. As a last resort the trial-and-error method can be used and in such cases it will often be helpful to have the cooperation of the engineering department. There will also be times when it will be advisable to send some welding jobs to outside concerns which have facilities, machines and methods that have been especially developed for certain kinds of work. There should be no hesitation about doing this even if the shop does have an excellent welding record. There are limits to what can be done without essential tools.

Careful Instructions Necessary

It is common practice in some places to turn a new job over to the shop with instructions only to "weld it." It is a definite mistake to follow any such practice. This custom probably originated as a result of the early applications of welding. In the beginning welding was employed principally for repairing worn or broken parts. The men in the shop did a lot of welding that the engineers knew little or nothing about. The welders learned by experience, some of it unhappy, what they could or could not do successfully. It was a natural consequence that when the engineers began to apply welding the shop men could tell them what to do. Under these circumstances the welders were allowed considerable freedom in manipulation.

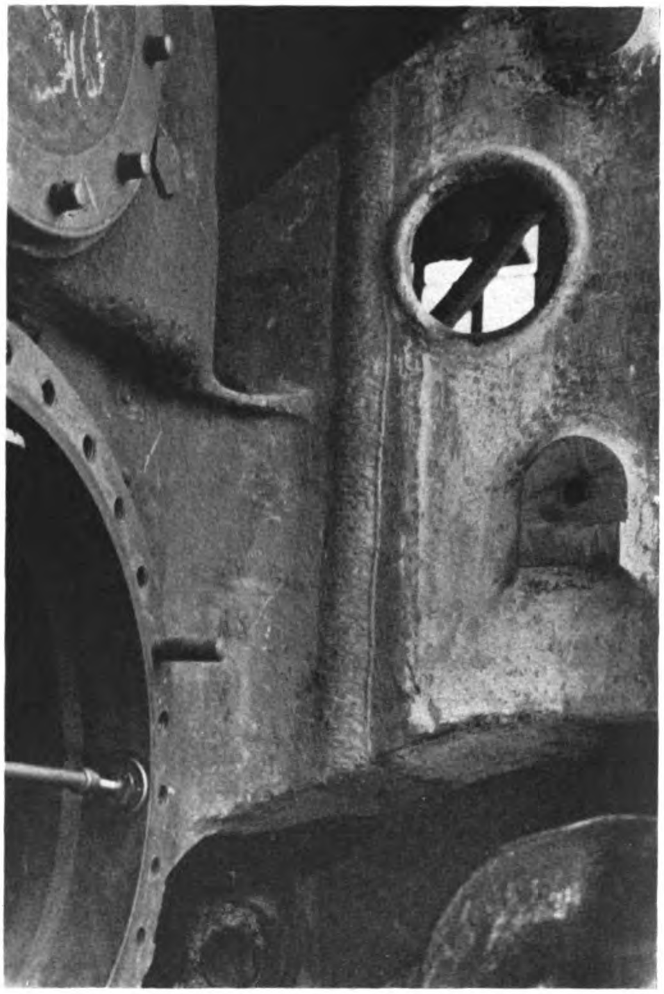
Now that welding has grown to a larger and more exacting field it is time to realize that the old practices may need to be changed. The engineer must contribute his share in the design, leaving to the welder only the responsibility for making good welds where and as the engineer indicates on his drawings. It is no longer practicable to permit the welder to decide how much welding should be done. He does not have sufficient information to determine how much welding is required. It is just as unsound a practice to leave the details as to size and length of welds to the operator as it would be to permit the riveting gang to decide what size and how many rivets to drive in a boiler. The strength might be adequate but the cost could hardly be expected to reach a minimum under such conditions.

It is very essential that new applications of welding be soundly engineered. To fail to do so is to invite unsatisfactory results. The size, length and location of all welds should be specified. The size and type of electrode, details of the various joints, and any heat treatment necessary should all be put on the drawing. This is a simple matter if the symbols of the American Welding Society are used. The objective should be to have the engineering just as complete and detailed as it would be for a similar job to be riveted. It is necessary that this be done for welding to compete successfully with other methods of fabrication or repair.

If the engineering is neglected there will be failures and they will be called welding failures when fundamentally they are due to insufficient engineering. If welding is properly applied it will usually result in economy with satisfaction in service.

Advantages of Welding for Repair Work

One of the marked advantages of welding is speed. Parts can be repaired quickly, frequently without being removed from the locomotive or other unit as the case may be. Not only is the time and labor necessary to re-



A heavy cast-steel weld

move and replace them saved but also the equipment is held out of service a minimum length of time. Repairing by welding usually saves some machining also because if new parts are used they are quite likely to require some machine work to fit them for service. Welding thus saves the material and at the same time reduces the burden on machine tools.

An excellent example of how welding may lead to a reduction in machining can be found in the electric arc application of bronze to driving boxes instead of casting it. In the method of casting the bronze it is necessary to machine dovetailed grooves into the box for mechanical anchorage of the bronze. When the surfaces are worn down it is necessary to remove the old bronze by machining so that a new wearing plate can be cast. In the welding method no grooves need be machined; the welding fuses the bronze to the steel surface of the box. When

the bronze has become worn a new layer is deposited on the old with only a slight surplus. One light cut to restore the desired dimensions is the only machining necessary. Machining of the steel is eliminated so far as the wearing faces are concerned and that on the bronze is reduced to a minimum.

Old boxes with grooves already cut can be adapted for welding by putting in steel plates or filling the grooves solid by welding before depositing the bronze. The welding method, therefore, has a definite advantage over the casting method in reducing the machining, whether bronze or babbitt is cast on the box. In the aggregate such cases sensibly reduce the amount of machine work that must be done. With the shortage of copper and tin the electric arc method of maintaining driving boxes should become even more popular as it requires much less bronze than the casting method.

The difficulty in obtaining steel castings at the present time and the possibility that there will be even more difficulty in the near future will necessarily lead to much more extensive reclamation of castings and very likely to the replacement of some by weldments fabricated from plates and shapes. In this field the cutting and welding torches can be the source of large savings. Parts can be cut, bent to shape so far as practicable and then welded together. In many cases such weldments will be cheaper, lighter and easier to repair subsequently than the castings they replace. They will be just as strong and somewhat more rigid than some assemblies having castings riveted in place.

Weldments may also have advantages in machining as the very nature of the material used in fabricating them lends itself well to producing flat, true surfaces which by careful welding can be held close to specified dimensions. Machine operations can be either eliminated entirely or reduced to a minimum. It is obvious that the successful and economical use of weldments to replace castings will depend upon careful engineering. Welding will be the simplest part of the operation.

How to Weld a Crack

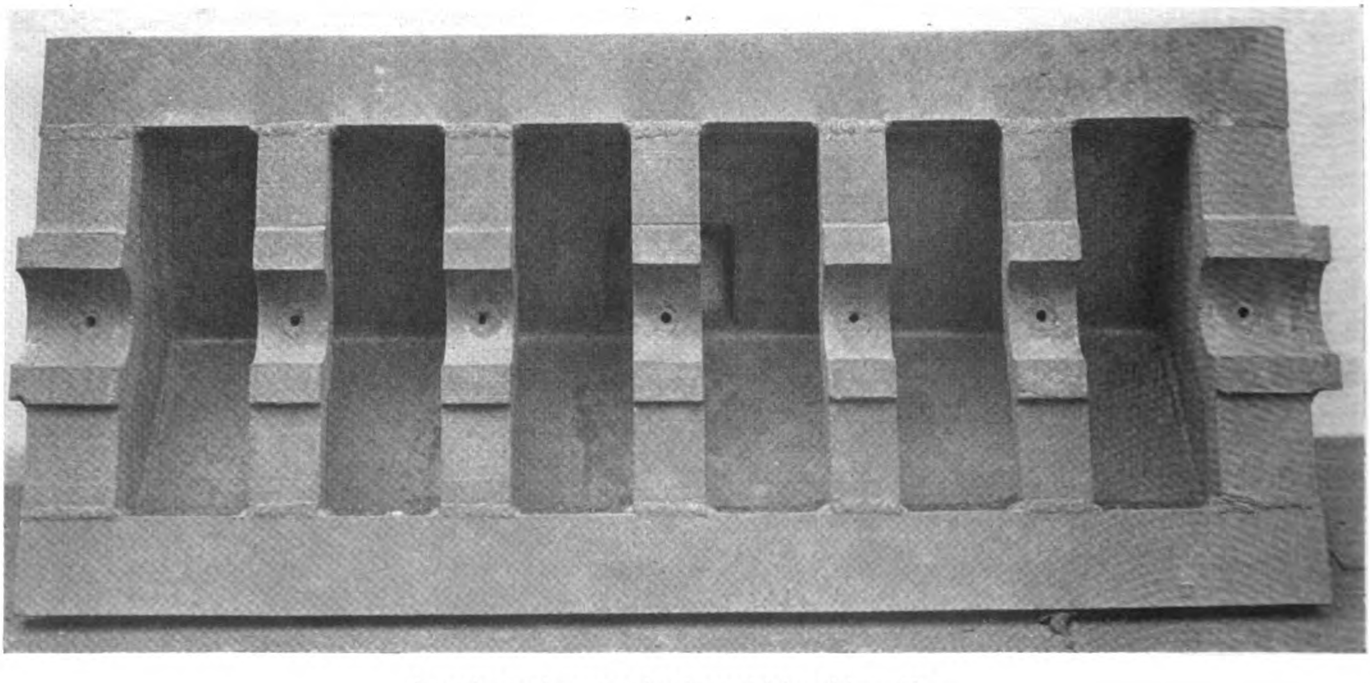
In repair work careful attention must be given to certain important details that frequently are neglected, overlooked, or considered inconsequential. For example, anyone familiar with welding will see failures due to improper procedure in welding cracks. Some are due to just depositing a single bead over the crack, others to veeing only part way through the section before welding. In such cases there is a crack existing from ten to ninety or more per cent through the section when the welding is completed. It should be clear that if the original whole section could not carry the load without failing, less metal than this will not carry it either. The proper course is to vee completely through the section so that the weld will have the same thickness as the original metal plus a slight reinforcement at the surface. This will eliminate the stress concentration condition that exists when part of the crack is left.

Cracks in cast iron often are very difficult to trace to their ultimate end. Seldom does the apparent end coincide with the actual end. Chipping is the most satisfactory way to prepare cracks in cast iron for welding but it tends to cover up the crack. It is best, therefore, to warm the metal with a torch flame to determine if all the crack has been removed. On a clean sand-blasted surface this heating will generally show if any of the crack remains. In any event it is wise to chip an inch or more beyond the apparent terminus of the crack or drill a hole through the casting at about the same distance.

Importance of Preparing

Proper preheating and subsequent cooling are especially important when welding cast or malleable iron, alloy steels or steel with more than about 0.30 per cent carbon. The heating prevents cracking, both microscopic and macroscopic, as well as preventing hardening that might interfere with subsequent machining. In the case of gas welding, preheating may pay dividends in the saving of time and expensive compressed gases. Charcoal or city gas are cheaper fuel sources than cylinder gases. Where routine work, such as building up pistons, is being done a suitable furnace for preheating combined with a device for rotating the piston will save money and enable the welder to do better work.

It is not necessary to discuss the importance of undercutting, slag inclusions, cracks, or some of the other weld defects that are visible on inspection. The harm they may do is well understood and as they are perfectly



A crank case for a gas-electric car fabricated by welding

obvious in the finished weld they can readily be corrected. They should not be tolerated.

How to Make Joints

In the early days of welding it was customary to bevel plates 45 deg. on each side of the joint. An included angle of about 90 deg. was necessary to avoid arcing of the bare welding rod on the edge of the plate or part way down in the joint. Now that coated electrodes are almost universally used for joints, or at least should be, this practice needs to be changed. The vee should be reduced to the minimum that it is possible to use for the particular conditions. There are no inherent advantages in a wide vee with coated rods but there are disadvantages. The wide weld costs a great deal more to make and both shrinkage and warping become more serious the larger the amount of deposited metal.

By using a vee of about 45 deg. included angle the weld can be made cheaper with coated rod than the larger weld could be made with bare wire. The weld is of course much superior when made with a coated electrode. The narrow opening is perfectly practical since the first pass can be made without any danger of arcing on the edges, the coating on the rod being a non-conductor. Careful attention to the size and shapes of the joint openings will pay dividends in lower costs and better welds. On heavy plates the J or U type of joint opening is usually the most economical.

Positioning Devices

The use of positioning devices to permit down-hand welding whenever possible should be encouraged. Much of the welding done in the mechanical department does not at first appear to be well adapted to positioning. A little ingenuity will show that much of it could be done better on a positioning device; the welders have simply become accustomed to turning the work by hand or making the welds as they come to them. If extensive reclamation work or fabrication of new parts is undertaken, positioning by means of either home-made jigs or commercial positioning tables will not only be found feasible but possibly essential to speed up the work.

Comparatively unskilled operators can do very satisfactory work if all the welding is down hand. Positioning of the work will thus lead to better welding and at the same time release the skilled welders for the work that cannot be positioned. The electrodes available for down-hand welding are fast and make welds with excellent physical properties and appearance. In down-hand welding it is possible to use rods that are larger in diameter and longer than those used for all-position work. This leads to economy in the amount of welding rod used. The stub discarded will be the same length whether the original rod was long or short. The unavoidable waste is significantly less with the longer electrodes.

How About Trained Welders?

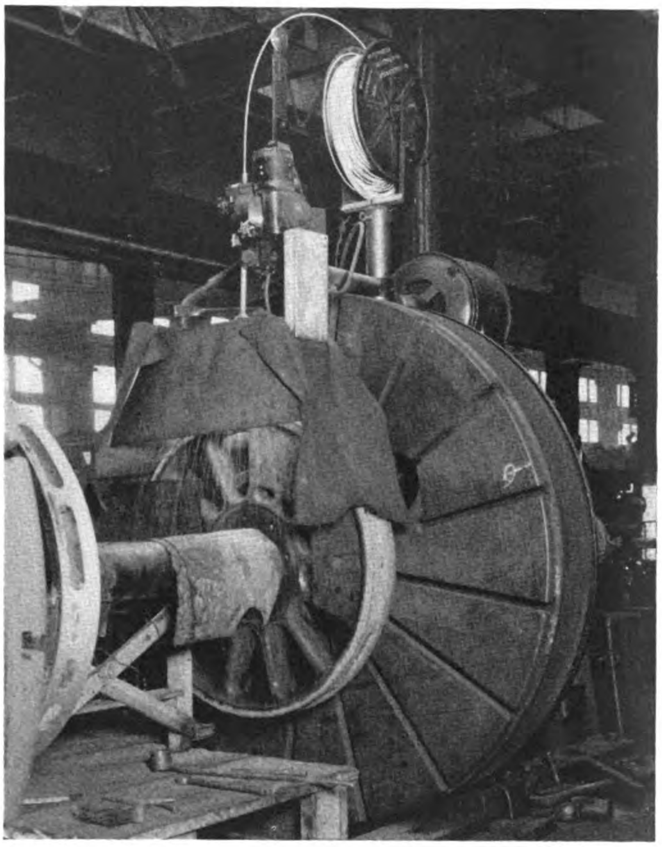
It may at first appear that it will be difficult to obtain enough trained welders for any extensive expansion of welding. This will not prove to be the case. The railroads have many men doing welding only intermittently who could well be assigned to welding continuously. They may appear somewhat inept in the beginning but in general will show remarkable improvement when welding regularly. Welding is an art that involves manual skill and hence requires constant practice for the best results.

Workers who have been at it a long time, as the majority of railroad welders have, possess the skill even though they may be handicapped in making the most of it through lack of knowledge of certain fundamentals of operating technique. This is especially true of the men who learned to weld with uncoated electrodes, in many cases with no assistance whatever. These men can quickly be taught some of the essential details of manipulation with coated rods and become very proficient welders. They have the skill but do not know how to apply it. Welding with bare wire requires more skill than for coated rods but the latter involve a different method of working.

If it should be necessary to hire new welders it will not be any more difficult to find trained men for this work than it would be to find skilled machinists or other classes of skilled labor.

Substantial Net Savings

Welding machines are not particularly difficult to obtain at present but in many cases no additional machines



Building up a driving-wheel center by machine welding

will be required. Those already available will be sufficient if put on an "all-out" basis. The welding-rod manufacturers appear to be able to take care of the ordinary rod requirements as long as they can obtain the necessary wire. In view of the immense tonnage of steel that can be saved for further use by welding, it appears safe to assume that the relatively small amount of steel needed for welding rods will be made available for the railroads.

When the railroads do expand their welding a lot of material will be saved for further use that in the past has been scrapped. The suggestions along this line in the Walt Wyre story in the December number of *Railway Mechanical Engineer* will not seem far fetched. Much material could be saved by means of a cutting torch and a little ingenuity such as that displayed by Foreman Evans. For example, wide sheets which are now difficult to get could be made by welding smaller sheets together. This, of course, would only be possible where welding is not prohibited, as for smokeboxes. Such things as dies can be saved by the use of only a few rods of special

hard-surfacing electrodes. A little Stellite or carbide powder applied with a torch may lengthen the life of parts subject to local wear to such an extent that the relatively high cost of the overlay is insignificant. There are hundreds of such applications and each shop will find numerous ones of its own. If a clearing house for such ideas could be established by a magazine such as *Railway Mechanical Engineer* many profitable suggestions could be passed along.

The American railroads were among the first industries to adopt the welding and cutting torches. There is no reason why they should not continue to be leaders. Mistakes have been made in the applications of welding and undoubtedly a lot more of them will be made. Some poor welding was done in the early days but this is typical of the development of any new art or industry. One need look only as far as the field of reinforced concrete construction for a very similar example.

Welding is young and still growing rapidly but already there is an abundance of proof that modern welding technique will produce dependable joints. Lack of faith in welding cannot be justified in the face of the record. Mistakes made in the past should not stop progress, nor will they as long as managers and engineers retain the rights and privileges assured them in a democracy. It is exceedingly appropriate that welding should play a very important part in the preservation of the democracies.

Improved Technique Increases Welding Speed

Increased arc speed in welding a 3/8-in. horizontal fillet is now possible, according to Lincoln Electric Company technicians who have worked on the development of the "Fleet-Fillet" procedure. Conventional methods average about 30 ft. per hour of deposited metal but can be in-

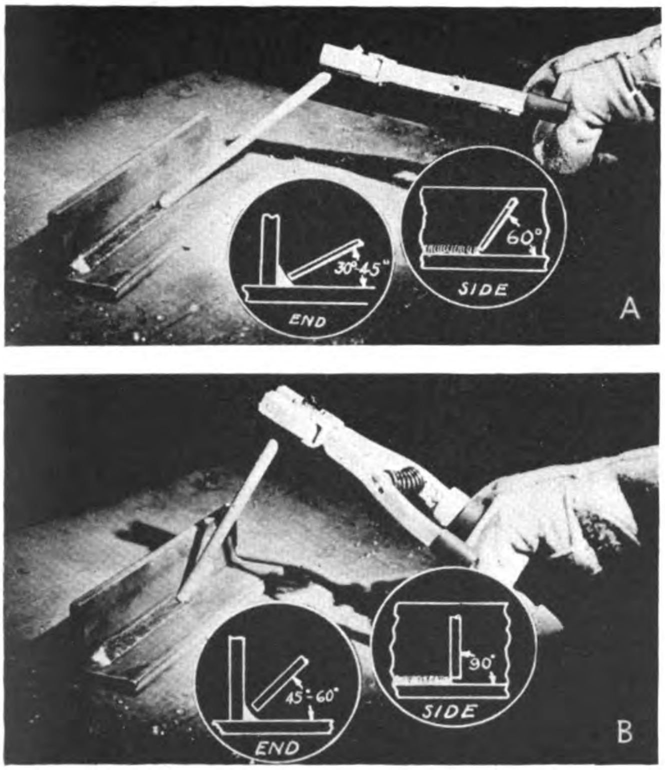


Fig. 1

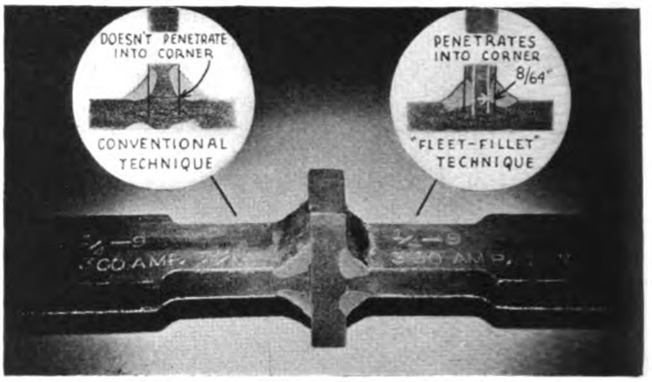


Fig. 2

creased to as much as 65 ft. per hour using proper type shielded electrodes with an increase in speed of travel and increase in current. Penetration at the root of the weld actually increases as indicated in Tables I and II.

Procedure in applying the new technique consists of four factors: (1) Hold the electrode at an angle as

Table I—Comparison Tests for Single-Pass Horizontal Fillets (Not Positioned) Made by Conventional and "Fleet-Fillet" Techniques

	Conventional method, Fig. 3(*a*)	"Fleet-Fillet" method, Fig. 3(*b*)	"Fleet-Fillet" method, Fig. 3(*c*)
Electrode (Fleet-weld), in.	¼	¼	¼
Current, direct; electrode negative, amp.	300	300	360
Arc speed, in. per min.	7	10	12
Size of fillet, as now defined, in.	24/64	17/64	18/64
Apparent throat 0.707 x (size of fillet), in.	17/64	12/64	13/64
True or effective throat, in.	17/64	17/64	20/64
Penetration beyond root or corner, in.	0	5/64	8/64
Ultimate load of joint in lb. per in. of length	27,000	27,000	Plate failed at 30,000
Comparative Costs			
Pounds of electrode per foot of weld	0.37	0.26	0.26
Electrode cost per foot of weld*, cents	2.2	1.5	1.5
Labor cost per foot of weld†, cents	5.8	4.0	3.3
Overhead, 100 per cent of labor cost, cents	5.8	4.0	3.3
Total cost, Labor, electrode and overhead, cents	13.8	9.5	8.1

* Electrode cost figured at 6 cents per lb.
† Labor cost figured at $1.00 per hr. with 50 per cent operating factor.

shown in Fig. 1(b); (2) in general, use higher currents; (3) advance the electrode at higher speed; and, (4) use electrodes recommended for the technique. In following these rules an economically practical average between the ideal fillet and the conventional fillet is obtained.

Two pairs of fillets, one made by conventional methods, and the other following the "fleet-fillet" technique are shown in Fig. 2. The fillet made by the new method has only 70 per cent as much deposited metal as the other, yet it has 15 per cent greater strength.

Tables I and II give comparisons showing the effect of arc speed on the effective throat of the weld; the amount of penetration beyond the root, or corner; strength of the weld; amount of electrode, and welding cost. Table I gives comparisons between conventional and "fleet-fillet" specimens welded in the horizontal position while Table II covers specimens positioned for downhand welding.

In conventional welding procedures, the electrode is held at approximately 45 deg. with the horizontal plate and at approximately 60 deg. to the line of weld with the end pointing backward, Fig. 1 (a). The arc is held short but speed of travel is usually so slow that the electrode must be held out from the plates being jointed to

keep the end of the electrode from dipping into the molten pool. In the new fillet technique the average position of the electrode is about perpendicular to the line of the weld at from 45 deg. to 60 deg. with the horizontal plate, Fig. 1 (b). The arc is so short that the electrode coating practically touches the plate. It is not objectionable to rest the coating lightly against the plates, but if it is forced against them a rough bead is likely to be obtained.

The conventional method of building up a multiple-pass horizontal fillet is shown in Fig. 5 (a), with the beads laid from the top down. With the "fleet-fillet" technique beads are laid from the bottom upward, as

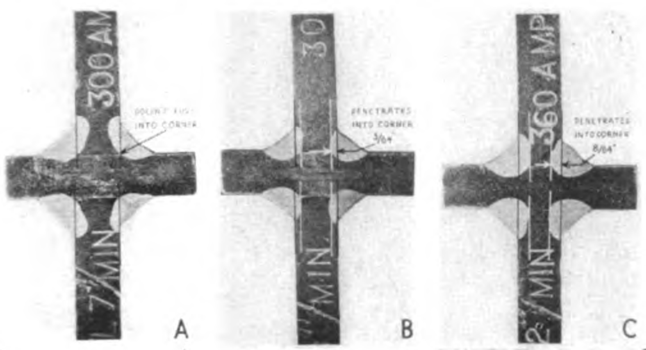


Fig. 3

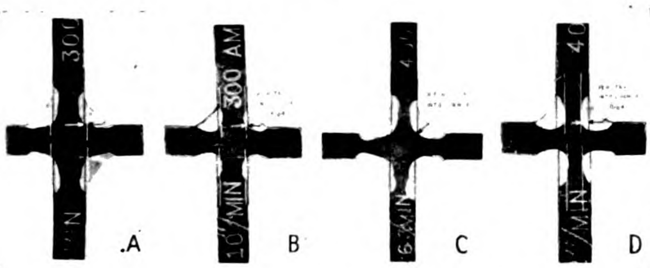


Fig. 4

shown in Fig. 5 (b). This method provides a flat horizontal surface upon which to place succeeding beads,

Table II—Comparison Tests for Single-Pass Positioned Fillets Made by Conventional and Fleet-Fillet Techniques

	Conventional method, Fig. 4(*a*)	"Fleet-fillet" method, Fig. 4(*b*)	Conventional method, Fig. 4(*c*)	"Fleet-fillet" method, Fig. 4(*d*)
Electrode (Fleetweld), in.	¼	¼	¼	¼
Current, direct; electrode negative, amp.	300	300	400	400
Arc speed, in. per min.	6	10	6	12
Size of fillet as now defined, in.	24/64	18/64	28/64	20/64
Apparent throat 0.707 x (size of fillet), in.	17/64	13/64	20/64	14/64
True or effective throat, in.	15/64	15/64	20/64	20/64
Penetration beyond root or corner	Missed fusing to corner by 4/64 in.	Penetration 2/64 in.	No penetration	Penetration 8/64 in.
Ultimate load of joint, lb. per in. of length	27,000	27,000	Plate failed at 30,000	Plate failed at 30,000
COMPARATIVE COSTS				
Pounds of electrode per foot of weld	0.43	0.26	0.57	0.28
Electrode cost per foot of weld*, cents	2.6	1.5	3.4	1.7
Labor cost per foot of weld†, cents	6.6	4.0	6.6	3.3
Overhead, 100 per cent of labor cost, cents	6.6	4.0	6.6	3.3
Total cost; labor, electrodes and overhead, cents	15.8	9.5	16.6	8.3

* Electrode cost figured at 6 cents per lb.
† Labor cost figured at $1.00 per hr. with 50 per cent operating factor.

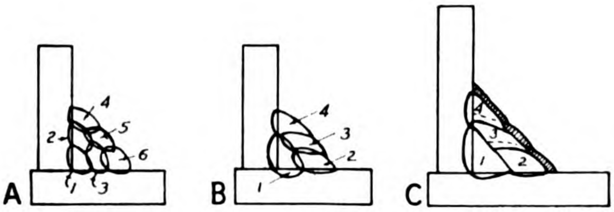


Fig. 5

permitting higher currents and faster welding. The first bead is laid in the corner using fairly high current and speed. Subsequent beads are applied with the electrode held at an angle of 70 deg. to 80 deg. with the horizontal plate and the line of weld except the beads against the vertical plate in which case the electrode should be at about a 45 deg. angle.

Using this new technique on multiple-pass welding, the slag is left on the bead in order to provide a dam to keep the metal from running off the edge of the previous bead. This is illustrated in Fig. 5 (c). The slag is not removed until after each layer of beads has been completed. In other words, for the weld shown in Fig. 5 (c), the slag is removed after the completion of beads No. 1 and No. 4. This procedure saves man-hours in the cleaning of the weld and also facilitates and speeds up the welding operation while making possible a smoother weld. Any number of layers may be applied in this manner. A weld containing 16 passes joining 1¼-in. plates is shown in Fig. 6.

Regardless of the nature of the fillet welding, i.e., whether it be single-pass, either horizontal or positioned, or multiple-pass, either horizontal or positioned, the new

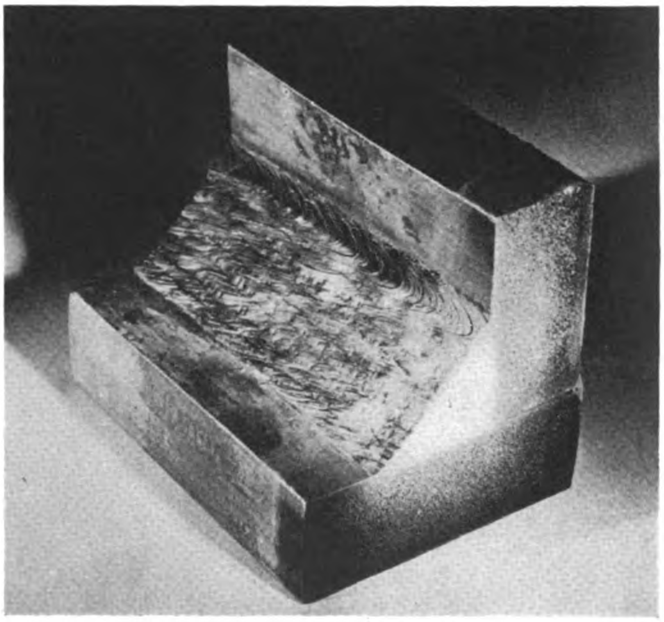


Fig. 6

"fleet-fillet" technique permits welding speeds up to 100 per cent faster than conventional procedure. The penetrations obtained are illustrated in Figs. 3 and 4 on specimens welded conventionally and with the faster recommended practice. Fig. 3 (a) and Fig. 4 (a and c) were produced according to conventional practice; while Fig. 3 (b and c) and Fig. 4 (b and d) illustrate "fleet-fillet" technique. Half-inch plates were used for these test specimens.

Training Welding Operators

Care in selection of trainees and instructors important — Training of limited scope often satisfactory — Safety instruction a vital part of any program

TRAINING of welders is not a recent development in nor addition to the duties of railway mechanical officers, supervisors and foremen. Few industries have had as large a part as the railroads in developing the techniques of welding and the education of welders in those techniques. The early history of oxy-acetylene welding is largely a history of changing processes in railway shops. Later years saw the introduction of electric-arc welding with the use of the bare electrode and, in this field, too, the railroads, especially their boiler shops, were prominent in working out procedures and qualifying operators. Training welders in the early years was mostly a matter of selecting men who were willing to try and letting them work out their own salvation within the somewhat elastic limits of quality of workmanship which were in force. Many of these men, keeping abreast of the times, have developed into the welding foremen and leaders in service in railroad shops today.

Most of the railroads have operating arrangements with contract companies in the oxy-acetylene field whereby service engineers and instructors are always available to give any necessary advice or assistance and, in many cases, to perform the more difficult welding jobs. As a result of the longer familiarity of railroads with the oxy-acetylene process and the close supervision exercised by contract company representatives, there are probably enough well-qualified gas welders on most railroads.

The development of electric arc welders, using coated electrodes, appears to be the field in which the training techniques of railroad shop organizations show the greatest lack of standardization. A study discloses that general acceptance of a single plan for training welders in industries other than the railroads has not as yet been arrived at although the basic principles of operator training have been reasonably well established. While reference to welders in the discussion of fields other than the railroads will relate to electric arc welding, most of the principles are equally applicable to the selection and training of men for oxy-acetylene welding.

Three methods appear to be open to the industrial employer who has need for an increase in his force of welders: training in industry, selection of private welding-school graduates, or hiring of public vocational school trainees. Each method has its advocates and generally the determination is made with reference to previous experience or the reported experiences of other employers. Where the need for welders is great all three methods may be followed.

Sample welds mounted on a demonstration panel in a plant of the Baldwin Locomotive Works. Trainees can check their own results against approved samples

Training men in service rarely aims at more than the development of satisfactory competency in the performance of one or two operations. Workers may be further trained as they display interest but the ruling factor in their early training is getting them into production as soon as possible. Most private schools and many of the publicly supported institutions give complete training in all fields of welding practice and include some work in welding theory. National-defense training courses usually aim at teaching the types of welding commonly used in the plants of the locality where the schools are operated. Their method is very similar to that employed in industrial plants which run their own training programs. Advanced courses are open to students who are interested in furthering their welding knowledge after they have obtained employment. In all cases, however, the Code of Minimum Requirements for Instruction of Welding Operators, published by the American Welding Society can be followed as representing the consensus of opinion of welding engineers for guidance in a training program.

Who Can Be Trained

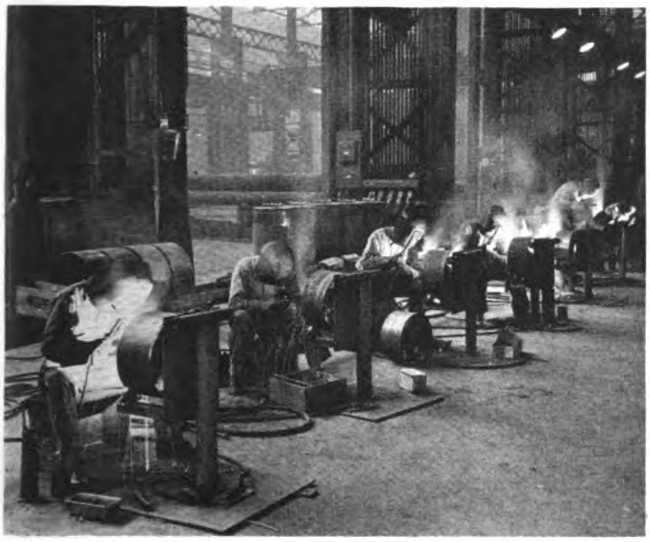
Hard and fast rules to be followed in the selection of trainable men have not been laid down, but a few standards are generally accepted. Physical characteristics often determine the success or failure of a trainee. Men of average size and weight seem more adaptable to welding operations that require movement on the job or adjustment to difficult working positions. Normal good health, good hearing, good natural, or properly corrected, eyesight and, probably, freedom from respiratory ailments must be demanded of trainees. Good hearing is important as a safety factor especially where the work being performed is done under noisy conditions; warnings often can be given only once and good hearing and immediate response may avoid accidents.

Good eyesight, natural or corrected, is necessary for the production of the best quality of work. Constant observation of an arc through protective glasses is a strain which may damage eyesight where an original weak eye condition exists. There is no evidence that welding is harmful to normal vision but if the operator requires corrective lenses they should be worn under the helmet or goggles at all times.

Less is known of the ill effects resulting from respira-

tory weaknesses. The best possible ventilation should be provided at all times but complaints from workers will be less frequent if all operators have good lungs with clear nasal and respiratory passages.

The age of men selected for training has been found to be a factor which affects the likelihood of their success in acquiring competency. Greatest progress and fastest rate of learning is among men between 18 and 35; between 35 and 40 learning may proceed more slowly but satisfactory results are achieved, especially where there is no attempt to create all-around welders but merely to give training in a small number of routine processes.



Welders trained by the Baldwin Locomotive Works who are now engaged in war production work

The field for men over 40 has been restricted because they have been considered less adaptable to change from previous work habits and because in this group many of the physical factors affecting competency lessen the chance for success in developing good operators.

Intelligence and Mechanical Aptitude

Proficient welders cannot be developed in any training program unless some attempt is made to evaluate initially their prospects of success. Elaborate tests to determine intelligence and mechanical aptitude do not appear to be necessary in selection of trainees although, if they are used, the class selected by test will produce a greater number of skilled operators than a group picked by the more generally applied methods of choosing workers. Faster learning and better end results are achieved. This is especially important in plants which undertake to train their own men; the cost of instruction is high, materials and machines, with their maintenance, are expensive. Also, less supervision will be required and less work will be rejected or will require re-welding when the trainee goes on production welding. Another important advantage in carefully choosing trainees is that the possibility of up-grading such employees is much greater than with a group which might meet the minimum requirements for the least difficult shop operations.

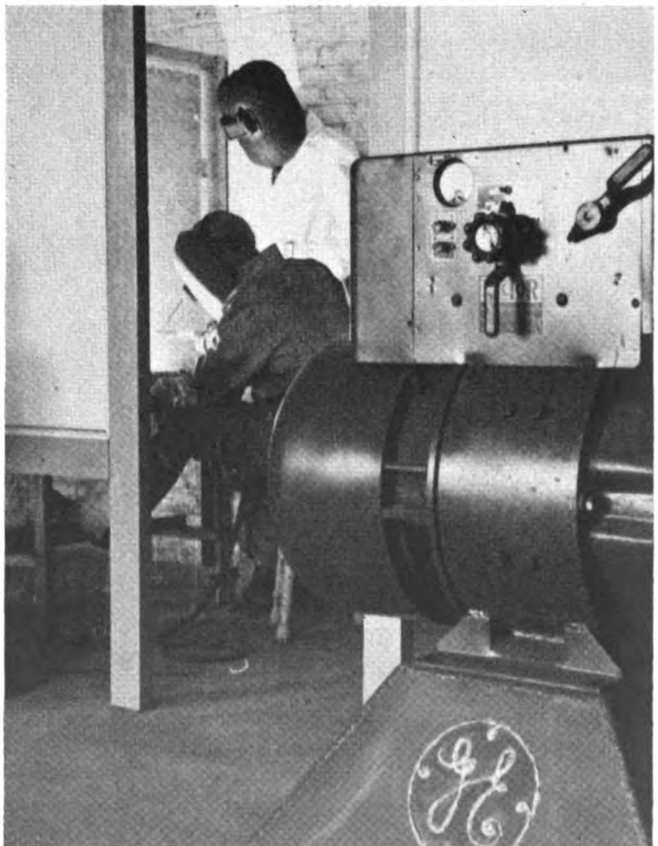
Instructors

The usefulness of any adequate system of picking men for training will be destroyed or seriously impaired by failure to furnish competent instructors. It is not necessary that such instructors be trained in formal educational methods but they must have the ability to impart to others the knowledge which they have gained themselves through training and experience. Lacking any more exact method, the policy seems to be to advance men who are of known competency as mechanics and who have the necessary knowledge of welding theory to meet the problems involved in the shop where training is being given. Other selective factors might be those which would apply in choosing a worker for advancement to a foreman's position.

The Training Program

The Code of Minimum Requirements is the first serious attempt at standardizing practices in school training. Many privately operated schools go beyond it as do some of the public institutions. In-service training by manufacturers usually depends upon the particular requirements of production and the extent to which it is desired to develop skill and range of ability. It is possible to state only in a general way what would be the average ability of all students trained by different schools and plants but it appears that in practice it approximates the following. Students are trained to make welds in at least three of the four recognized positions: flat, overhead, vertical and horizontal. They learn to make bead welds, single-pass fillet welds, multiple-pass fillet welds and may be instructed in making groove welds. Tests for contour, soundness of welds and the extent of fusion are important in determining student progress and they are often made to demonstrate to the student errors or good work observed by the instructor. The use of such tests allows students to work without immediate supervision and still receive informative criticism from the instructor.

Theory receives less general attention but the Code calls for instruction on the following topics: safety in welding; welding machines; welding processes and weld-

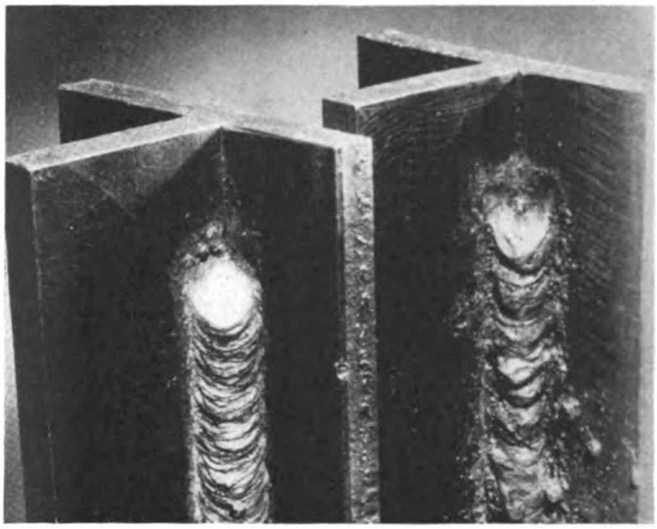


Individual attention for each student speeds learning

ing terms; weld gages and how to use them; characteristics of good welds; methods of testing welds; codes, standards and specifications relating to welding; inspection of welds; the nature of iron and steel, and types of electrodes and their uses.

Safety in Welding

The training of good welders requires that they must be thoroughly taught the rules of safe practice. In any instruction course sufficient time should be allowed to impress on every student the necessity of observing these elementary rules:* (1) Wear proper shoes and clothing; (2) Use a helmet or shield having the proper protective glass when welding or in the vicinity of welding; (3) provide adequate ventilation on all jobs; (4) wear goggles when chipping or grinding; (5) remove all combustible materials from the vicinity of welding or cutting operations; (6) strike an arc only on the work to be welded; (7) avoid bodily contact with "live" electrical circuits; (8) prevent the electrode holder from becoming grounded; (9) observe that cable connections are tight and that cables do not become hot; (10) if using a gasoline-driven welding machine in a confined space make provision for venting the exhaust gases; (11) keep tools and equipment in their proper locations so that there is no possibility of stumbling over them; (12) be aware of the surroundings at all times and make no move until it is certain that it is safe; and (13) take proper precautions before welding or cutting containers which have, *or might have*, contained combustibles.†



Proper welding current produced the vertical fillet weld on the left. Too high current on the weld on the right resulted in spatter and a rough surface condition

Discussion of the proper training of welders in safe operating practices, covering both their own well being and the safety of others, indicates the extent to which other industries have concerned themselves with a problem which is always of primary importance. The other code headings listed are explanatory in themselves or serve to bring out the fields in which railroads might expand their training program, or they can serve as guides in the establishment of programs where none are now in operation.

Additional Helps in the Training Program

Most of the larger welding equipment and electrode manufacturers have published adequate instructions concerning the use of their products and some of them have available texts which can be used as basic or supplementary material in classrooms or shops. Service engineers are often able to offer helpful suggestions in the planning of a schedule which will give maximum results in the shortest possible time. Private sources, especially the American Welding Society, can furnish much material on welding practices although most of it is probably of too technical a nature for use in elementary welding training.

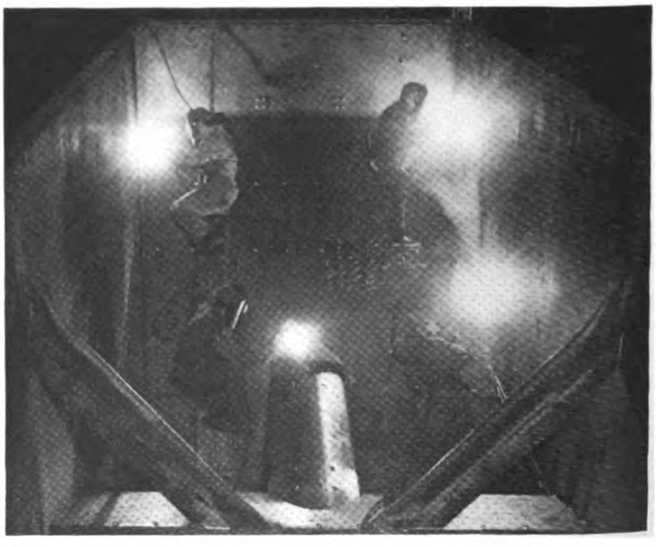
An important aid in supplementing class lectures, private study, actual demonstration, and student practice is the new series of colored motion picture films being distributed by the General Electric Company. First of their type in the field, these films, six in all, explain and emphasize the principal factors of good welding.

Although much that has been found useful in industrial training is also to be found in railroad welder-training programs, some of the roads have achieved excellent results under systems which they have developed to meet their particular needs.

Selection of Trainees A Railroad Problem

One of the great problems in railroad mechanical departments is selection of the men to be trained. Many roads have labor agreements which require the payment of differential rates to welders. These operate to allow senior men in roster standing to bid in the more highly paid jobs whether or not they are qualified as welding operators when they exercise their rights. Few roads recognize, or are permitted to treat, welding as a craft and maintain separate rosters of qualified welders.

The operation of seniority clauses in shops paying straight hourly rates often results in skilled mechanics bidding in welder's openings only to take advantage of the difference in pay rates. Since most of these men are in the age group considered least adaptable to learning new skills, the net result is a loss of skilled craftsmen and the addition of at best only moderately competent welders.



Welders who took training on their own time to qualify for work on welded hopper car construction

In shops where piecework payments are in force, the payments to welders are usually for straight time plus

* See Safe Practices Pamphlets No. 23 and No. 105, published by the National Safety Council, Inc., Chicago. Also, Health Protection in Welding, published by Metropolitan Life Insurance Co.

† See American Welding Society's Recommended Procedure to Be Followed in Preparing for Welding or Cutting Certain Types of Containers Which Have Held Combustibles.

the welding differential. Since piecework income will usually exceed straight welder's pay, senior craftsmen prefer to retain their normal work and leave welding to younger men. This operates to the shop's advantage because the junior mechanics have received more welding training in their apprenticeship courses in recent years. They also qualify in most or all of the previously enumerated requirements for competent welding operators.

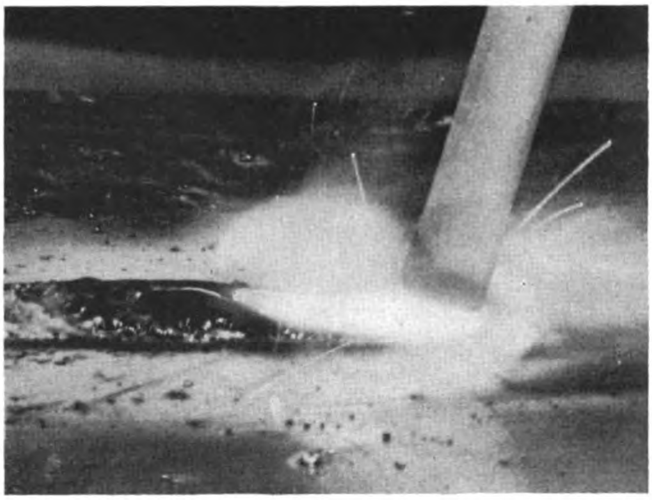
Where no added hourly payment is made to welders over the rate standard in the recognized crafts less difficulty is experienced in obtaining men for training who more nearly meet the selective tests of other industries. Here, although seniority rights are still recognized, the tendency is for older men of high roster standing to remain in their craft and continue to perform duties they know well. Lacking financial incentive, applicants for training will be those who have a real interest in welding and the desire to learn.

It is not evident that welding, as a craft, merits a wage premium over other shop occupations which require the completion of an apprenticeship or its equivalent. The problem of selection of the best type of trainees is certainly less where no differential is paid.

How Men Are Trained

Some welding instruction is included in most apprenticeship training courses today. Six months is a fairly common allocation of time in the usual four-year term and is proving adequate. In fact, it exceeds the ordinary period of training in most reputable private trade schools. The effort is to develop competency in both oxy-acetylene and electric arc processes and as apprentices complete their training, railroads are building up a reserve of men to whom welding is no mystery. Because of the limitations of many craft agreements most of these men cannot be used as welding operators. Other training programs must be devised to instruct men who desire training to qualify for differential rates.

In cases where the pay scale for welding attracts men



Close observance of the arc crater and arc action is necessary for good welding

from the tops of the rosters, it is customary to grant such applicants a specified period of time in which to qualify. Ninety days is a common trial period and during this time learning is done on the job. Without previous welding practice or experience such workmen are immediately assigned to production work. Progress in learning will vary with individuals but essentially this

Instruction in the care, operation and characteristics of welding machines is an important part of training

method of training is not greatly different than that followed in the earliest bare-electrode days.

During the trial period some applicants find their previous occupation more desirable and voluntarily return to it. Others who hang on for the time allowed for qualification fail to pass even the usually simple tests required and are returned to their former work. Of those who remain a few will eventually become good all-around welders. Most of the others will be satisfactory if their work is largely repetitive.

Labor-Management Cooperation in Training

On one railroad, which planned a car construction program in which welding was involved extensively, representatives of the carmen's organization approached the management with a proposal for preliminary training. Electric arc welding had not been used to any great extent and there were few qualified welders for freight-car work. The employees volunteered to learn welding in hours after the regular working day if the management would furnish facilities and supplies. Instructors were volunteers from among the skilled operators in the shop and they served without pay.

In this instance only minimum skill in horizontal and vertical and flat welding with all-position electrodes was needed and most of the men qualified without difficulty. Some, realizing that they would not like welding, dropped out of the training groups. Those who completed their training formed a substantial nucleus around which was built up the construction force.

It is interesting to note that all of the men who chose this form of training would have been entitled to bid in welder's vacancies and learn on the job when the construction program started. Instead they chose to anticipate the call for additional welders and qualify in advance. They made possible the full output of cars according to schedule from the date building was started. The management by this alone was repaid for the cost of materials used in the voluntary training classes.

Training Welders in Reserve

At every major shop and enginehouse on a railroad which does not pay a differential to welders a pool of trained operators is maintained to fill vacancies as they occur. When additional welders are required to maintain the pools at their pre-determined strength bulletins are posted advertising training opportunities. The responsible mechanical-department officers choose trainees from the applicants with seniority a determining factor in the selection. As previously explained, older mechanics do not often bid in these training opportunities.

If the chosen trainees pass a medical examination covering vision, hearing, lungs and heart, and have no hernia or history of dizzy spells, they enter the formal training period. This period covers a maximum of 21 days on paid time in regular class groups. No production is expected of trainees. Class members may submit their first test specimens on the twelfth day of training and must submit them on the fifteenth day. If they fail on the first test, a second qualifying test is given after three additional days of training; a final three days is allowed after a second failure. If test specimens submitted after 21 days are not satisfactory, the trainee returns to his regular craft roster standing.

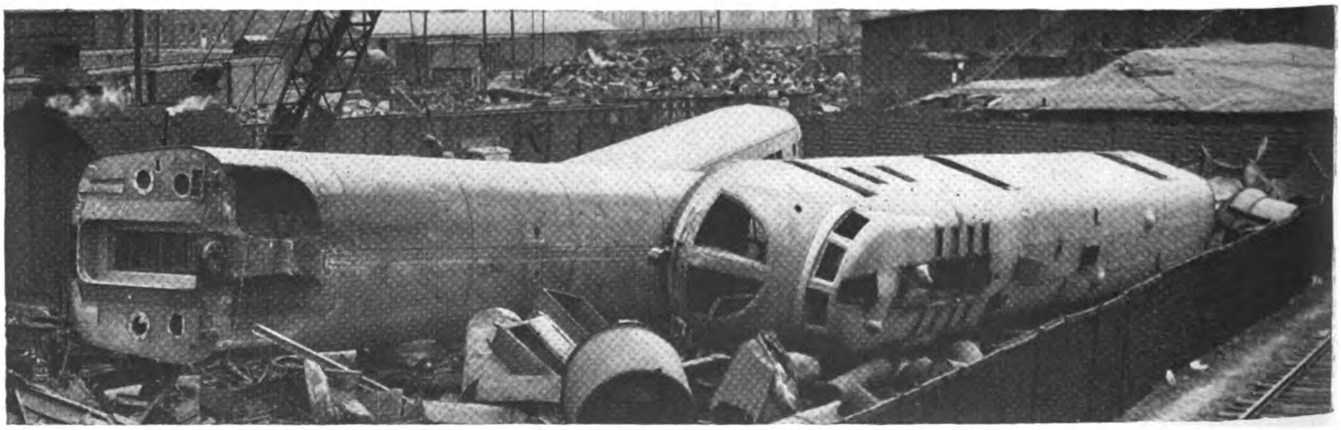
Men who qualify are assigned to the pool at their point of service and are required to bid in the first bulletined welding jobs for which they are eligible. Failure to accept welding work when it is available results in the removal of a man's name from the welder's roster and bars bidding in the future. This does not prejudice a man's standing on his regular craft or helper's roster.

Qualifying Tests

Some roads depend entirely on observation by immediate supervisors or welding leaders or foremen to determine competency. Others require the welding of tensile test pieces, nick-break specimens, or both. Some have graded tests or require certain experience before advancing welders to the more difficult welding operations. In one instance it was found that monthly test pieces were demanded of all welders and closely checked by mechanical officers.

It has been found that periodic testing of the quality of welds serves, in some instances to keep welders from becoming lax where long familiarity with a particular type of work has a tendency to develop a false feeling of confidence in their ability. The importance of periodic testing is well recognized in the welded pressure-vessel industry and is of value in any field of welding.

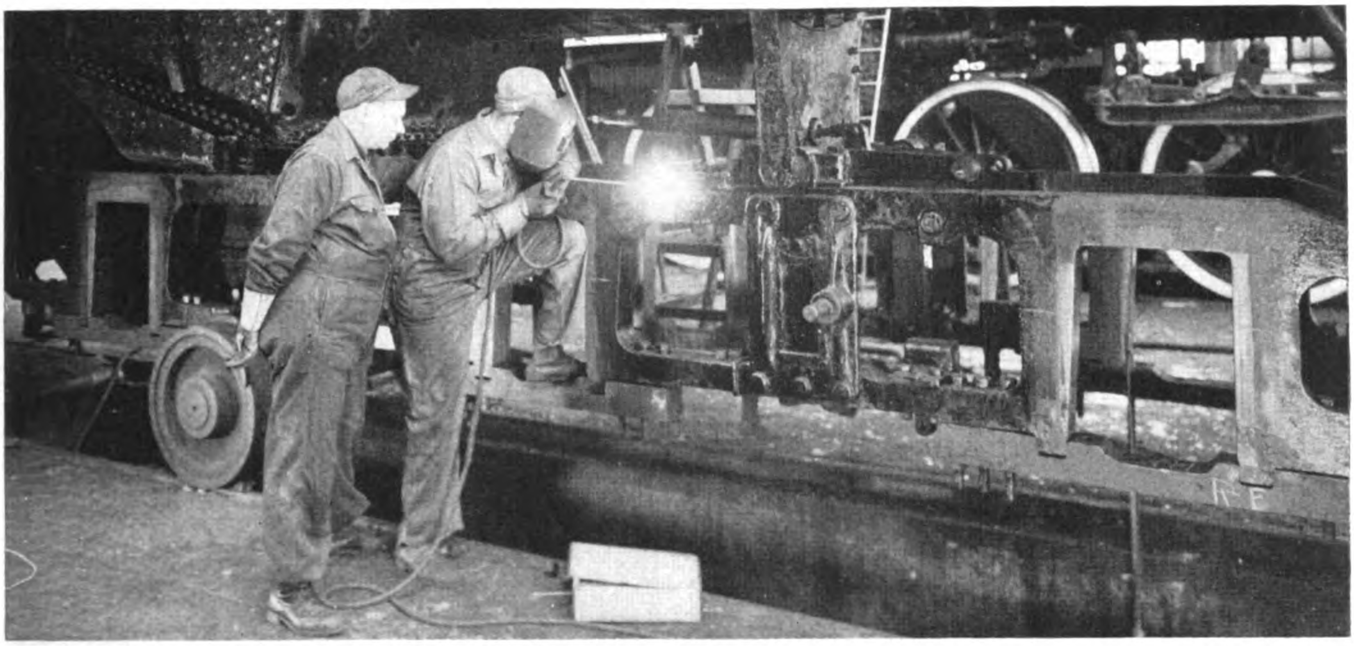
* * *



The "City of Salina" being dismantled at the Union Pacific yards

The M-10000, later named the "City of Salina," was the first high-speed streamline aluminum train. It was built by the Pullman-Standard Car Manufacturing Company and was delivered to the railroad in February, 1934. Although the power plant, a 600-hp. 12-cylinder distillate-burning engine, was worn out and obsolete, the train could have been continued in active service indefinitely so far as the structure of the cars was concerned. The train was of tubular cross-section, with the outer surfaces of aluminum sheets and framework built of extruded aluminum-alloy sections. It consisted of three articulated units, the forward unit containing the power plant, a 33-ft. mail compartment, and a small baggage room. The second unit was a 60-passenger coach, and the third unit, a 56-passenger coach with a buffet in the rear for serving light meals. The overall length of the train was 204 ft. 5 in. Scrapping the train made 64,000 lb. of aluminum available for war purposes.

What Do the Railroads Weld?



Any tabulation of the jobs done by welding in the shops of railway mechanical departments is, at best, incomplete. Each day sees a greater extension of welding practices. With present material shortages and delays in deliveries mechanical officers are considering more and more parts of their equipment with reference to weldability. Structural parts and accessories are now being welded that would have been scrapped a few years ago because reclaiming or repairing by welding was more expensive than the purchase of new material. Today it is necessary to consider primarily the requirement of keeping motive power and rolling equipment in service; cost of welding is not being considered if it eliminates delays in releasing equipment. Many of the welding practices to which the railroads have gone will be continued after materials again become more freely available because they are proving economical as well as mechanically satisfactory.

The lists which appear on these pages were prepared after study of the welding manuals of eleven large railway systems, and shop visits and interviews with welding supervisors and foremen of several railroads. They are not published as being complete, it is even doubtful that they include all of the items being repaired, reclaimed or fabricated in the shops visited. Not all of the railroads studied perform all of the operations shown. Some which permit the building-up of worn surfaces on some pieces will not allow the welding of cracks and fractures on the same pieces; others permit both. Fabrication by welding and application of parts by welding are more extensively done on some roads than on others. Methods vary with the determinations of engineering departments, test engineers or shop welding committees; one railroad may specify oxy-acetylene welding with a preheat where another calls for electric-arc welding without preheat; still another makes the method to be followed optional. Shop equipment and the availability of skilled operators is often a determining factor here.

Repair, reclamation, fabrication and application — Railroads increasing range of welding interests — Methods are not uniform

In general it may be said that, for all of the items listed, either the electricarc or the oxy-acetylene method may be followed. Procedural difficulties and cost make the choice of methods one to be studied with reference to each application.

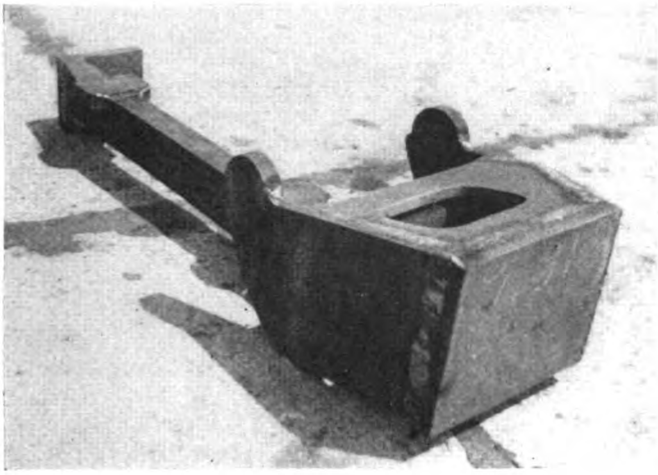
Railroad shops are actually performing the operations indicated in the following lists or their welding manuals provide a procedure to be followed.

A List of Car and Locomotive Parts Which Are Repaired by Welding

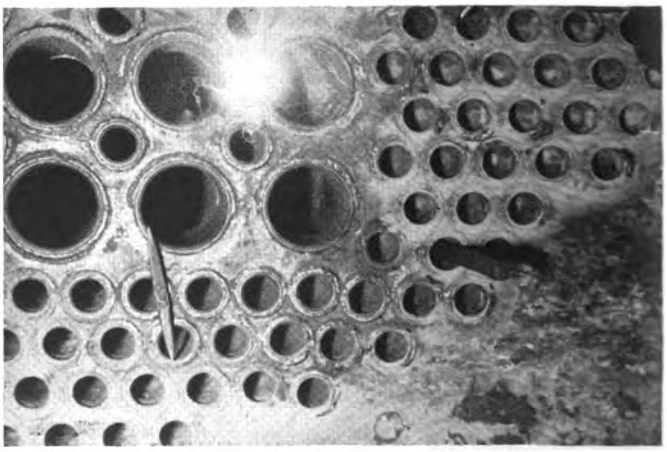
Locomotive Parts	Type of Operation* 1	2	3	4	5
Air compressor	..	..	X	..	..
Air pump bottom head stops	..	X	..	..	..
Air pump center section	..	X	..	..	..
Air pump cylinder	..	..	X	..	..
Air pump valve seat	..	X	..	..	..
Ashpan	X	X	X	X	X
Ashpan angle	X	..	X	..	X
Ashpan axle guard	X	..	X	X	X
Ashpan damper	X	..	X	..	..
Ashpan damper crank	..	X	X	..	..
Ashpan damper crank support	X	X	X	..	..
Ashpan damper handle	X	..	X	..	..

* 1.—Welding holes. 2.—Building up worn surfaces. 3.—Welding of cracks and fractures. 4.—Fabrication entirely, or in part, by welding. 5.—Applied to locomotives or cars by welding.

Locomotive Parts	Type of Operation 1	2	3	4	5
Ashpan damper hinge	X	X	X	..	X
Ashpan dump lever	..	X	X	..	..
Ashpan hopper	..	X	X	X	..
Ashpan hopper slide guide	..	X	X	..	..
Ashpan support	..	X	X	..	..
Bell	..	X	X	..	..
Bell clapper	..	X	X	..	..
Bell stand	..	X	X	..	..
Bell stand seat	..	X	X	..	..
Bell yoke	..	X	X	..	..
Blowoff valve arm	X	X	X	..	..
Boiler, exception unstayed surfaces	X	X	X	X	X
Boiler bearing	..	X	X	..	..
Boiler bearing plate	..	X	X	..	X
Boiler bearing saddle	..	X	X	..	..
Boiler brace	..	..	X	..	..
Booster engine crosshead	..	X	..	..	..
Booster engine crosshead guides	..	X	..	..	..
Booster engine cylinders	..	..	X	..	..
Booster engine piston heads	..	X	..	..	..
Booster engine throttle valves	..	X	..	..	..
Booster throttles	..	..	X	..	..
Brackets	X	X	X	X	X
Brake beam	..	X	..	..	..
Brake cylinder	..	X	X	..	..
Brake cylinder equalizer	..	X	..	..	..
Brake fulcrums	..	X	..	..	..
Brake hanger	..	..	..	X	..
Brake hanger bracket	..	X	..	..	..
Brake head	..	X	..	..	..
Brake lever	..	X	X	..	..
Brake pipe	..	X	X	..	X
Brake rod	..	X	..	..	..
Brake shaft bearing	..	X	..	..	..
Buffer casting	..	X	..	..	..
Bull ring	..	X	..	..	..
Bumpers	..	..	X	..	..
Bushing, on rods for grease plug	..	..	..	..	X
Cab	..	..	..	X	X
Cab gutter	..	..	X	X	X
Cab seat	..	..	X	X	X
Cab seat frame	X	..	X	X	X
Cab ventilator	X	X	X	X	X
Cab window slide	..	X	X	..	..
Cellars	..	X	..	..	..
Chafing iron	..	X	..	..	..
Copper-clad steel tubes in electric locomotive boilers	..	..	..	..	X
Counterbalance	..	..	..	X	..
Coupler bodies	..	X	..	..	..
Coupler horn	..	X	..	..	..
Coupler knuckles	..	X	..	..	..
Coupler locks	..	X	..	..	..
Coupler pocket	..	X	..	..	..
Coupler yokes	..	X	..	..	..
Cover plate tender trucks	..	X	..	..	..
Crossheads, except piston rod, keyway and wrist pin fits	..	X	X	X	..
Crosshead guide	..	X	..	..	..
Crossties	..	..	X	..	..
Cylinder	..	X	X	X	..
Deck	..	X	X	..	..
Dome casing	..	X	X	X	..
Draft castings	..	X	..	..	..
Driver brake connecting rod	..	X	..	..	..
Driving wheel spoke	..	..	X	..	..
Drypipe	..	X	X	X	..
Dynamo bodies	..	..	X	..	..
Eccentric crank	..	X	X	..	..
Eccentric rod	X	X	..	..	..
Eccentric strap	..	X	..	..	..
Equalizer, if not in tension	..	X	..	..	..
Equalizer support bracket	..	X	X	..	..
Exhaust nozzle	..	X	X	X	..
Expansion pad	X	..	X	..	..
Expansion pad cap	..	X	..	..	..
Exhaust pipe	..	..	X	..	..
Feedwater heater	..	..	X	..	..
Feedwater pump bodies	..	..	X	..	..
Filler castings	..	..	X	..	..
Firebox ring	..	X	X	X	..
Firedoor	X	X	X	..	..
Firedoor catch	..	X	X	..	..
Firedoor cylinder head	..	X	..	..	..
Firedoor cylinder strap	..	X	..	..	..
Firedoor damper	..	X	X	..	..
Firedoor deflector	..	..	X	..	..
Firedoor foot pedal	..	X	..	..	..
Firedoor foot pedal connecting rod	..	X	..	..	..
Firedoor frame	..	X	X	X	X
Firedoor guide	..	X	X	..	..
Firedoor handle	..	..	X	..	..
Firedoor handle connecting rod	..	X	X	..	..
Firedoor hinge	..	X	X	..	..
Firedoor hinge bracket	..	X	X	..	..
Firedoor hood	..	X	X	X	..
Firedoor latch	X	X	X	..	..
Firedoor operating cylinder	..	..	X	..	..
Flange lubricator bodies	..	X	X	..	..
Flues	..	X	..	..	..
Flue sheets	..	..	..	..	X
Flue sheet bridge	..	..	X	..	..
Foot plate	..	..	X	..	..
Frame, locomotive and truck	X	X	X	X	X
Frame brace	..	X	X	X	X
Grates	..	X	..	..	..
Grate bearers	..	X	X	..	..
Grate connecting rod	..	X	X	..	..
Grate crank	..	X	X	..	..
Grate crank bracket	..	X	X	..	..
Grate end frame	..	X	X	..	..
Grate lever	..	X	X	..	..
Grate lever catch	..	X	X	..	..
Grate lever fulcrum	..	X	X	..	..
Grate lever hanger	..	X	X	..	..
Grate rocker trunnion	..	X	..	..	..
Grate shaft	..	X	..	..	..

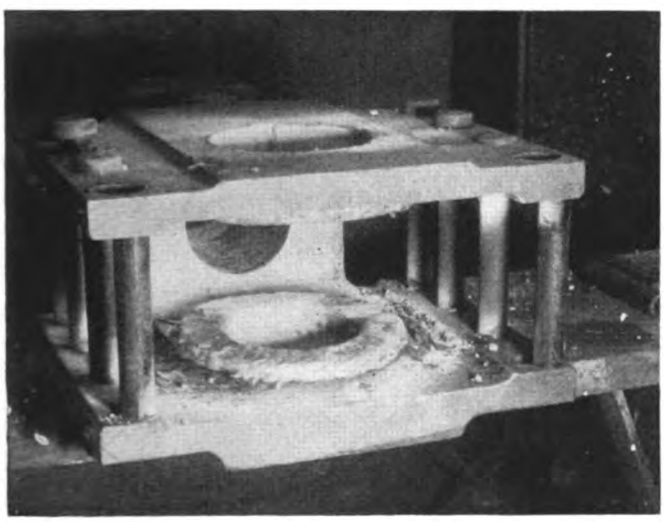


All-welded Southern valve gear support bracket



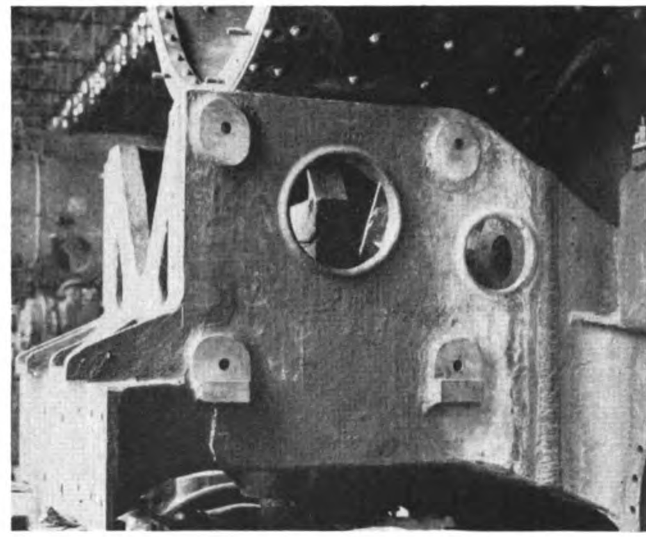
Welding superheater tubes to sheet

Locomotive Parts	Type of Operation 1	2	3	4	5
Grate shaft bearing	..	X	X	..	..
Grate shaft bracket	..	X	X	..	..
Grate shaker	..	X	X	..	..
Guide yoke	..	X	X	X	..
Handrail bracket	..	X	..	..	..
Hub	..	X	X	..	..
Hub faces on truck boxes	..	X	..	..	..
Hub liners	..	..	..	..	X
Injector bracket	..	X	X	..	..
Injector connecting rods	..	X	X	..	..
Injector overflow pipe	..	X	X	..	..
Injector steampipe	..	X	X	..	..
Journal box lid	..	..	X	..	..
Journal box lid hinge	..	X	..	..	..
Lubricator	..	X	X	..	..
Motion work	..	..	..	X	..
Mud ring cross brace	X	X	X	..	..
Pedestal, locomotive	X	X	X	X	X
Pedestal binder	..	X	..	..	..
Pedestal crosstie	X	X	..	..	..
Pedestal jaw	..	X	..	..	..
Pedestal tie	..	X	..	..	..
Petticoat pipe	..	..	X	X	X
Pilot	X	X	X	X	X



Built-up crosshead wrist pin hole—Pipe braces hold crosshead open to correct size

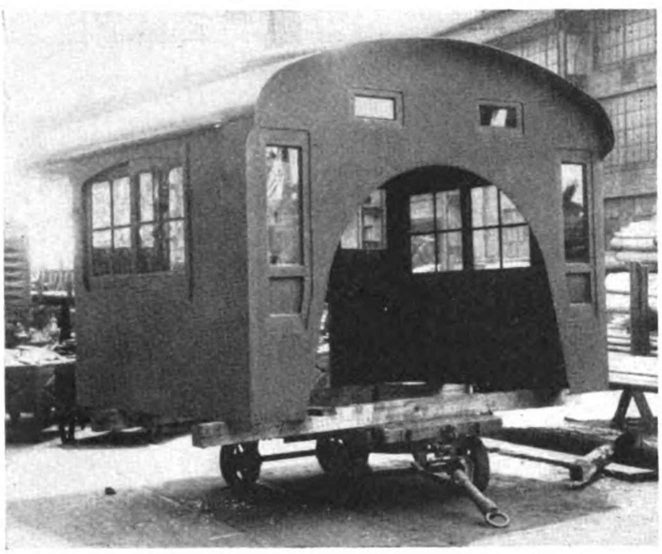
Pipe	..	X	X	X	X
Piston	..	X	..	X	..
Piston heads	..	X	..	..	..
Piston valve and valve stem	..	X	..	..	..
Power reverse crank pin	..	X	X	..	..
Power reverse connecting rod	X	X	X	..	..
Power reverse crosshead and guide	X	X	X	..	..
Power reverse cylinder	..	..	X	..	..
Power reverse levers	X	X	..	..	..
Power reverse piston and valve	..	X	..	..	..
Power reverse piston follower	..	X	..	..	..
Power reverse rocker	..	X	..	..	..
Power reverse valve chest	..	X	X	..	..
Power reverse yoke	X	X	X	..	..
Pull rod	..	X	..	..	..
Radius bars	..	X	..	..	..
Reach rod	..	X	X	..	..
Rocker bearing	..	X	..	..	..
Safe ending boiler tubes and flues	..	..	..	X	..
Safe ending copper tubes in electric loco. heat. boilers	..	..	..	X	..
Safety chain lug	..	X	..	..	..
Sand box	..	..	X	X	..
Sand box arm	..	X	X	..	..
Sand box connection	..	X	X	..	X
Sand box cover	..	..	X	..	..
Sand box rod and handle	..	X	X	..	..



Cracked or wreck-damaged bed castings can be repaired by welding

Locomotive Parts	Type of Operation 1	2	3	4	5
Sand pipe	..	X	X	..	X
Slack adjuster clevis	..	X	..	..	..
Smokebox	..	X	X	..	..
Smokebox door	..	..	X	..	..
Smokestack	X	X	X	X	X
Snow plow	..	..	..	X	..
Speed recorder wheels	..	X	..	..	..
Spring hanger seat	..	X	..	..	..
Spring hanger wear plates	..	..	..	..	X
Spring seat	..	X	X	..	..
Staybolt sleeve	..	..	..	..	X
Steam chest	..	..	X	..	..
Steam chest bushing	..	X	..	..	..
Steam chest cover and casing	..	..	X	..	..
Stoker cradle casting	..	X	X	..	..
Stoker cylinders	..	..	X	..	..
Stoker drives	..	X	X	..	..
Stoker elevator casings	X	X	X	..	..
Stoker elevator shaft bearings	..	X	X	..	..
Stoker engine cylinder head	..	X	X	..	..
Stoker engine frame	X	X	X	..	..
Stoker engine brackets	X	X	X	X	X
Stoker operating handles	X	X	X	..	..
Stoker rack housing	..	X	X	..	..
Stoker reach rods	..	X	X	..	..
Stoker screws	..	X	..	..	..
Superheater return bends	..	X	..	X	X
Superheater tube	..	X	X	..	..
Throttle lever	..	X	..	..	..
Throttle lever latch handle	..	X	..	..	..
Throttle lever latch link or connection	X	X	X	..	..
Throttle lever quadrant	..	X	..	..	..
Throttle rod	..	X	..	..	..
Throttle stuffing box	..	X	X	..	..
Throttle valve and stem	..	X	..	..	..
Throttle valve case	..	X	X	..	..
Train control receiver housing	..	X	..	..	..
Transom or chafing plate	..	X	..	..	..
Truck centering device	..	X	..	..	..
Truck equalizer	..	X	..	..	..
Truck side frame	..	X	X	..	..
Tube	..	X	..	..	..
Turbine	..	X	X	..	..
Valve gear crossheads	..	X	..	..	..
Valve gear frame bracket	..	X	X	..	..
Valve gear frames	..	X	X	X	..
Valve gear links	..	X	..	..	..
Valve gear link blocks	..	X	..	..	..
Valve handles	..	X	X	..	..
Valve rod	X	X	..	..	..
Washout plug	..	X	..	..	..
Wheel center, except hubs	..	X	X	X	X
Whistle crank	X	..	..	..	..
Whistle lever	X	..	..	..	..
Whistle lever rod	..	X	X	..	..

Car Parts	1	2	3	4	5
		Type of Operation			
Air brake hose coupling	..	X	..	..	..
Air compressor control cabinets	..	..	..	X	..
Armature shafts	..	X	..	..	..
Axle collar	..	X	..	..	..
Baggage car doors	..	..	..	X	..
Baggage car ends	..	X	..	X	..
Baggage car lockers	..	..	..	X	..
Baggage rack	..	..	X	X	..
Battery box	..	..	X	X	X
Battery box supports	..	..	X	X	X
Bell crank	..	X	..	..	..
Body bolster	..	..	..	X	..
Body bolster cover plates	X	X	X	..	..
Body bolster stiffeners	..	..	X	..	X
Body bolster web plate	..	..	X	..	X
Body brace	..	..	X	..	..
Body center plate	X	X	X	..	..
Body cross tie	X	X	X	..	..
Body side bearing	X	X	X	X	X
Bolster center casting	..	X	..	..	..



All-welded locomotive cab

Car Parts	1	2	3	4	5
Bolster guides	..	..	..	X	..
Bottom rod guard or emergency support	..	X	..	..	X
Brace	..	..	X	..	X
Brake beam	..	X	..	..	..
Brake beam support	X	X	X	X	X
Brake cylinder	..	..	X	..	..
Brake cylinder back head	..	X	X	..	..
Brake cylinder crosshead	..	X	X	..	..
Brake cylinder lever connection	..	X	..	..	..
Brake cylinder tie rod	..	X	..	..	..
Brake cylinder tie rod anchor	..	X	..	..	..
Brake hanger	..	X	..	..	..
Brake hanger bracket or carrier	X	X	..	..	..
Brake head	..	X	..	..	..
Brake head guide, passenger	..	..	..	X	..
Brake lever	X	X	..	..	..
Brake lever bracket	X	X	..	..	..
Brake lever fulcrum	X	X	X	..	..
Brake pipe	..	..	..	X	X
Brake shaft bracket	X	X	X	..	X
Branch pipe tee support	..	..	X	..	X
Brine tanks, refrigerator cars	..	..	..	X	..
Buffer	..	X	..	..	..
Buffer plate	..	..	..	X	..
Buffer spring bracket	..	..	X	X	X
Caboose car steps	..	..	..	X	..
Caboose splash plates	..	..	..	..	X
Caboose stoves	..	..	X	..	..
Carline	..	..	X	..	X
Center plate	..	X	X	..	..
Center plate reinforcement and rear draft gear lugs	..	..	..	X	..
Center sill	..	X	X	X	..

Car Parts	1	2	3	4	5
		Type of Operation			
Center sill separators	..	..	X	X	X
Connecting rod, brake	..	..	..	X	..
Corner post	..	..	X	X	X
Coupler carrier	..	X	X	X	X
Coupler centering device	..	X	..	..	..
Coupler head	..	X	X	..	..
Coupler horn	..	X	X	..	..
Coupler knuckle	..	X	..	..	..
Coupler knuckle lock	..	X	..	..	..
Coupler knuckle pin	..	X	..	..	..
Coupler lock lifter	..	X	..	..	..
Coupler shank	..	X	..	..	..
Coupler yoke	..	X	X	..	..
Cover plate	..	..	X	..	X
Crossbearer	X	X	X	..	X
Crossbearer or crosstie cover plate	..	..	..	..	X
Dead lever fulcrum bracket	..	..	..	X	..
Dead lever guide	..	..	X	..	..
Diagonal braces	..	..	X	..	X
Diaphragm of a vestibule	X	X	X	X	..
Door clasp	..	X	..	..	..
Door hasp holder	..	..	X	..	..
Door hasp staple	..	..	..	..	X
Door pin chain	..	..	..	..	X
Door threshold plate	..	..	X	..	..
Door track	..	..	X	X	X
Door track bracket	..	..	X	X	X
Draft casting	X	X	X	..	..
Draft gear pocket	..	..	..	X	..
Draft lugs	..	..	X	X	X
End door frames, freight	..	..	X	X	X
End plate	..	..	X	..	X
End post and end sill	X	..	X	..	X
End sheet	..	..	X	..	X
End top angle	X	..	X	..	X
Equalizer	..	X	..	..	..
Equalizer guide, passenger	..	..	..	X	..
Equalizer spring seat	..	..	..	X	..
Flexible gear centers, passenger	..	..	..	X	..
Floating lever bracket	X	X	X	X	X
Floating lever connection	..	X	..	..	..
Floor beam	..	..	X	..	..
Floor plate	..	..	X	X	..
Followers	..	X	..	..	..
Garbage tubes, dining cars	..	..	..	X	..
Gusset plates	X	..	X	..	X
Hopper	..	..	X	..	..
Hopper door	X	X	X	X	X
Hopper door frame	X	X	X	X	X
Hopper door hinge	X	X	X	X	X
Hopper door locking pawl	..	X	..	..	..
Ice hatch, dining cars	..	..	..	X	..
Journal box and bearing wedge	..	X	X	..	..
Journal box bolts	..	X	..	..	..
Journal box lid	..	..	X	..	..
Journal box water deflecting strip	..	..	..	..	X
Knuckle	..	X	..	..	..
Marker bracket	..	..	X	X	X
Pedestal tie bar	..	X	X	..	..
Pipe, brake cylinder and auxiliary reservoir	..	..	..	..	X
Platform	..	..	..	X	X
Push-pole pocket	..	..	X	X	X
Reservoir support (Air brake)	..	..	X	X	X
Roof	..	..	..	X	X
Running-board bracket	..	..	..	..	X
Side-door frame (Freight)	..	..	X	X	X
Side plate and side post	..	..	X	..	X
Side rail and side sill	X	..	X	..	X
Side sheet	..	..	X	..	X
Side stake	..	..	X	X	X
Sink drains—Dining cars	..	..	..	X	X
Spring plank	X	X	X	..	..
Stall partitions, horse cars	..	..	..	X	..
Striking plate	..	..	..	X	..

Car Parts	Type of Operation 1	2	3	4	5
Swing hanger	X	X	..	..	..
Tables bases, dining cars	..	..	..	X	..
Transom	..	X	X	..	..
Truck bolster	..	X	X	..	..
Truck lever connection	..	X	..	..	..
Truck side bearing	X	X	X	X	X
Truck side frame	..	X	X	..	..
Winding shaft	..	X	X	..	..
Winding shaft rachet wheel and pawl	..	X	..	..	..
Window casing	X	..	X	X	X
Window frame	X	..	X	X	X
Window post	X	..	X	X	X
Yokes	..	X	..	..	..

Can It Be Welded?

Certain limitations on welding have been established by the Interstate Commerce Commission and by the A. A. R.—Individual railroads have added their own

AFTER fusion welding was introduced as a tool for car and locomotive repair work its use extended rapidly. It provided a simple, cheap and easily applied means of reclaiming and restoring worn-out material, and repairing failed or partially-failed parts, in many cases without removing them from the car or locomotive. Inevitably the question of safety was bound to arise.

At the 1915 convention of the Master Car Builders' Association, as a result of a discussion of the hazards arising from the welding of arch bars, a general study of the need for limitations on the use of welding was inaugurated which culminated in a committee report presented at the 1919 meeting of Section III Mechanical, of the A. A. R. This report recommended a list of car parts on which the welding of cracks should not be permitted; a list of worn car parts on which building-up should be permitted; and a list of car parts on which welding of fractures should be permitted.

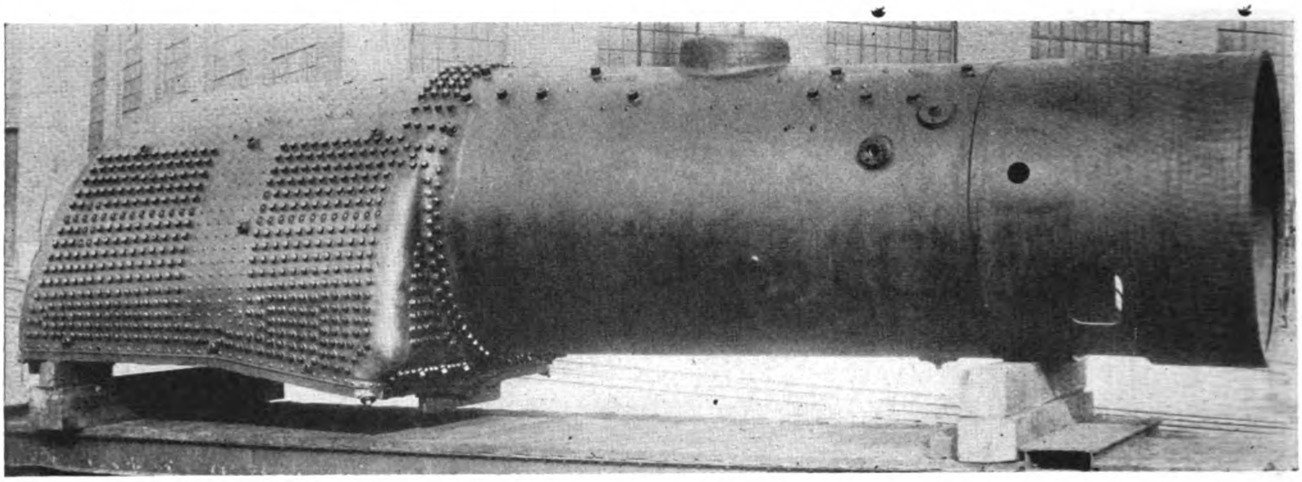
The recommendations made were adopted as recommended practice and, with relatively few changes, are embodied in Interchange Rule No. 23 today. Although this rule applies only to cars in interchange, the same principles are generally observed by most roads in relation to their locomotive maintenance. Briefly stated the principles are: Welding should not be permitted on parts subjected to high tensile stress, nor on parts made of alloy steel, or heat treated carbon steel. Exception of some parts, either partially or wholly subjected to tensile stresses, are made to the prohibitions against welding, provided the unimpaired material is not less than a specified percentage of the full-section area.

The Bureau of Locomotive Inspection and the Bureau of Safety of the Interstate Commerce Commission have established standards to be followed by all railroads and in their rulings have indicated the parts of cars and locomotives on which welding will not be permitted. Main and side rods may not be welded, and unstayed boiler surfaces may not be subjected to fusion welding heat. Welding on safety appliances is prohibited.

Railroad shop practice has developed a list of car and locomotive parts on which one or more railroads prohibit welding although there may be other roads which permit such welding. These items are shown in the list together with those which are prohibited by law or the A. A. R. Rules of Interchange.

Locomotive and Car Parts on Which Welding of Cracks and Fractures Is Not Permitted

Air reservoirs
Alloy steels
Axles
Bolster hangers
Brake beam hangers
Brake beam tension and compression members
Brake heads; malleable iron
Brake levers
Brake pullrods
Brake staffs
Brake wheels
Chains
Coupler heads
Coupler knuckles
Coupler knuckle pins
Coupler locks
Coupler lock lifters
Coupler lock throwers
Coupler yokes; wrought iron; cast steel, some exceptions
Crank pins
Crossheads at neck or wrist pin holes
Diesel engine connecting rods
Diesel engine crank shafts
Diesel rotating system members is highly stressed
Drawbars
Drawbar pins
Eccentric blades, cranks and rods
Equalizers; cast steel tender truck; driving wheel; engine truck; trailing wheel and passenger truck
Heat-treated carbon steel
Hubs of wheel centers
Injector bodies
Journal boxes
Main rods; except grease cup bushings
Piston rods
Reverse levers
Safety appliances
Side rods; except grease cup bushings
Spring hangers
Steam turrets
Superheater headers
Tanks of tank cars
Tires
Top chord angles if more than five feet from body bolster
Truck tie bars
Uncoupling levers
Unstayed boiler surfaces
Valve crossheads
Valve gear radius bar
Valve rods
Valve stems
Water columns
Wheels
Worn parts; beyond established wear limits



The Delaware & Hudson welded boiler will complete five years' service next September

What About

The All-Welded Boiler?

As the Delaware & Hudson boiler approaches the end of its five-year trial the Bureau of Locomotive Inspection grants provisional approval for other welded boilers — Construction held up by War Production Program—Promise of trouble-free service very attractive

DURING the early years of fusion welding in railway shops its use expanded at a tremendous rate. Indeed, it was soon looked upon as a cure-all for the ills resulting from wear and weakness or failure of parts. Its great attraction lay in the ability to restore or patch many worn or failed parts in place, thus saving the out-of-service time and the labor cost of removal and replacement.

In boiler repairs it proved particularly useful in patching firebox sheets and was also used to weld up or patch cracked barrel sheets. In the former case, where the support of the sheets did not depend upon the weld, it was successful. But, the same cannot be said with respect to its application on barrel plates which are entirely self-supporting. The welds had to be made from the outside only and were not stress relieved; they were frequently followed by further failures of the sheets, either in or adjacent to the welds. Hence, all welding on unstayed surfaces, except seal welding supported by riveting, is now prohibited by the Bureau of Locomotive Inspection.

For a number of years the Bureau in its reports called repeated attention to the fact that where welds were involved in the overheated area of crown sheets which failed because of low water, the sheets usually separated by tearing along the weld. Now the established rule is to confine welding in firebox sheets below lines 14 in. below the highest point of the crown sheet. Exceptions are the seams by which the back head and the inside door sheet are attached to the side and crown sheets.

Welding Accepted in Stationary Field

Fusion welding is recognized as a satisfactory means of joining parts in stationary-boiler and other pressure-vessel construction. This recognition was gained, however, only after a long and painful struggle. Increasing employment of fusion welding in this field ultimately brought the matter to the attention of the American Society of Mechanical Engineers Boiler Code Committee. In 1918 the National Welding Council requested that it be allowed to join the Boiler Code Committee in a thorough study of this situation.

The latter committee, early in 1918, appointed a subcommittee on welding to draft rules for safe welding practice. Within a year the National Welding Council had merged with the new American Welding Society and in January, 1920, the Boiler Code Committee requested the new society to appoint a conference committee to participate in drafting a set of welding rules for boiler construction.

The two bodies represented a wide range of interests and opinions and years of hard work were put in by both before a code could be agreed upon. Finally, in 1925, the first edition of the Code for Unfired Pressure Vessels was brought out. This code, later extended to cover power boilers, and the accepted procedure for welding and for the qualification of welders evolved by the American Welding Society have contributed tremendously to the attainment of assured results in welded structures. Combined with the X-ray method of testing, which discloses the hidden conditions within the welds, the advantages of certainty now lie with weld-

ing rather than with riveting under accepted methods of inspection of riveted construction.

Early Railroad Interest

Within six years after the A. S. M. E. Boiler Code Committee had adopted its first welding code, the officers of the Delaware & Hudson and the American Locomotive Company began a joint study which culminated in a design for a conventional locomotive boiler of all-welded design. In 1935, the General Committee of the Mechanical Division, A. R. A., took up the subject and instructed the Committee on Locomotive Construction to consult the builders and conduct a preliminary investigation of a basis of procedure and of the scope of research and tests which should be undertaken. Learning of the progress of the joint D. & H. and American Locomotive Company project, the committee joined forces with those at work on it. When completed, the design of the D. & H. boiler was thoroughly reviewed and approved by the sub-committee of the Locomotive Construction Committee, by representatives of the three steam locomotive builders, and by a representative of the American Welding Society.

Permission was then granted by J. M. Hall, director of the Bureau of Locomotive Inspection, I. C. C., to build, subject to final approval of the design by the General Committee of the Mechanical Division, one boiler which was to be considered experimental until it had completed five years of service.

This boiler is designed to carry a working pressure of 225 lb. per sq. in. with a factor of safety of five. The boiler shell is conical in form, 88 in. outside diameter at the front and 94 in. outside diameter at the firebox end. The tube sheet is laid out for a Type A superheater, with 316 2-in. tubes and 46 5⅜-in. flues. The firebox is 114¼ in. wide by 131¹⁵⁄₁₆ in. long inside at the mud ring. The shell course is of 1¹⁄₁₆-in. special low-carbon steel plate. Both longitudinal and circumferential seams are double butt welds and are allowed an efficiency of 90 per cent. The throat sheet and top connection between the shell and firebox wrapper is a unit, of 1³⁄₁₆-in. plate. The firebox wrapper is ⅝ in. and the back head ⁹⁄₁₆ in. thick. The back-head flange is deep enough to bring the welded seam between two rows of staybolts. The front tube sheet is a disc welded against a ring which, in turn, is fillet welded to the boiler shell. Crow feet for braces are riveted to the boiler heads and shell.

The D. & H. Boiler Built in 1937

The boiler was built at the Dunkirk, N. Y. plant of the American Locomotive Company. Facilities were arranged so that all welding was down hand. The welded seams were all examined by X-ray. When the shell and outside firebox structure was completed, it was shipped to Chattanooga, Tenn., for stress relieving in a furnace which was gradually brought up 1,100 to 1,150 deg. F. and held at that temperature for 2¼ hours and then cooled down in the furnace. A careful check of the structure after stress relieving revealed no distortion whatever.

The boiler then went to Schenectady, N. Y., for the insertion of the inside firebox and tubes, which were seal welded in the back head. After completion, the welds were hammer tested at a hydrostatic pressure of one and one-half times working pressure and then the hydrostatic pressure run up to two times the working pressure.

This was in March, 1937. After the boiler was received by the D. & H., it was used as a stationary boiler for a period of six weeks for observation and check before mounting on locomotive No. 1219. It was finally released for road freight service on September 24, 1937.

At quarterly inspections during the first year the jacket and lagging were removed and the seams all examined under 225 lb. boiler pressure. At the first annual inspection, September 24, 1938, the examination took place under a hydrostatic pressure of 340 lb. During the second year it was inspected semi-annually, and during subsequent year, annually. At each of these inspections the hydrostatic test was made at 340 lb. pressure.

The final annual inspection prior to completion of the five-year experimental period will be made during August, 1942. At all preceding inspections examinations of the welded seams have failed to reveal a single simmer. Apparently the boiler is in the same condition as when it went into service. As of June 1, 1942, Locomotive No. 1219 has made about 264,000 miles since the all-welded boiler was installed.

Riveted-Boiler Troubles

Since the D. & H. all-welded boiler has been in service there has been a growing feeling among mechanical-department officers that welding, properly supervised and conducted according to approved codes, holds attractive possibilities for the elimination of difficulties which have been growing acute in boilers of riveted construction designed to carry high pressures. The use of alloy steels to bring the weight required with higher boiler pressures back within former limits has been accompanied by other difficulties. Cracking of shell-courses have been reported after a period of service so short as to make the cost of maintenance and loss of use of the locomotive a problem of serious proportions. The cold-working of the heavy plates, the sudden change in stiffness of section arising from the lapping of heavy plates or from the application of welt strips, and the heavy caulking required tend to produce either sudden changes in stress concentration or heavy initial local stresses.

The problem of caustic embrittlement to which so much attention has been paid during the past few years is also involved. As it is now understood, caustic embrittlement takes place only where highly stressed metal is subjected to high caustic concentration. Such concentration is believed to build up in joints or around rivets where there are minute leaks. It is at such points as these that damage from caustic embrittlement is most evident.

It would seem, therefore, according to the current theory, that the all-welded boiler eliminates two of these conditions: first, the experience with the D. & H. boiler indicates that welding, according to approved procedure, leaves no place for leaks, and, second, that it eliminates the principal causes of local stress concentrations. Furthermore, the reduction in weight effected by the absence of heavy overlaps and rivet heads in the double butt-weld construction goes far to offset the effect of the increase in plate thickness required by higher boiler pressures without resort to the higher tensile strength of alloy steels.

In discussing the question of safety, it must be remembered that for several years past all boiler explosions have been the result of crown-sheet failures caused by low water. No change in the method of fabrication or the structure of the boiler exterior can increase or decrease the number of these failures. Judged by the statistics of failures, therefore, an improvement in the safety of the boiler structure will not be of outstanding importance. That such an improvement may be expected to result from a more general application of welding,

however, seems more than probable. The welded boiler is surrounded by safeguards in the form of X-ray examination and rigid code requirements as to stress relieving and acceptance tests. Thus, it is freed from the possibilities for hidden defects which exist in the riveted boiler and has the advantage of more uniform stress distribution.

Present Status

The experience of the D. & H. with its welded boiler has been so satisfactory that application has been made to the Bureau of Locomotive Inspection for the approval of the construction of another all-welded boiler. This application has been approved by the Bureau subject only to the provision that the building of the boiler will not interfere with essential war production and that the design and construction conform in all respects to the provisions of the A. S. M. E. Boiler Construction Code. As the matter now stands, such interference seems likely to hold further procedure in abeyance until there has been a reduction in the demands of the war-production program.

The Chicago, Milwaukee, St. Paul & Pacific has also developed a design for a completely welded locomotive boiler which has been approved by the sub-committee of the Committee on Locomotive Design of the A. A. R. The construction of a boiler from this design has also been approved subject to the same provisions as those referred to in connection with the D. & H. For much the same reason procedure in this case is being held in abeyance:

In the meantime, the Boiler Code Committee of the A. S. M. E. has proposed the addition of a number of rules to Section III of the Boiler Construction Code, which deals with boilers of locomotives. These rules provide for the all welded construction of locomotive boilers. Essentially, they set forth the procedure and test requirements developed in the construction of the first D. & H. all-welded boiler. These proposed rules for welding boilers of locomotives have been published for criticism and approval.* Subject to modifications which may be suggested by the comments or criticisms received by the committee, they will ultimately be adopted and become a part of the Code.

There are several respects in which the provisions of these rules are more severe than those pertaining to locomotive boilers of riveted construction. In the first place, a factor of safety of five rather than of 4½ is required. The welded boiler must be subjected to a hydrostatic test two times the maximum allowable working pressure after a hammer test of the welds which is made while the boiler is under hydrostatic pressure one and one-half times the maximum allowable working pressure.

While the prospects for the immediate extension of welded boiler construction are not bright because of the critical shortages of material and production capacity, the progress thus far made will undoubtedly lead to an extension of the benefits to be derived from boilers of this type as soon as there is relief from the present essential war production program. The construction of such boilers, however, will have to be under rigid control to assure workmanship of high quality carried out according to established procedures. To permit the building of welded boilers under a condition making such control difficult or impossible would be courting failures which would be sure to jeopardize the future progress of the art.

* See *Mechanical Engineering* for May, 1942, page 399.

Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Welding Coupler Yokes To Shanks

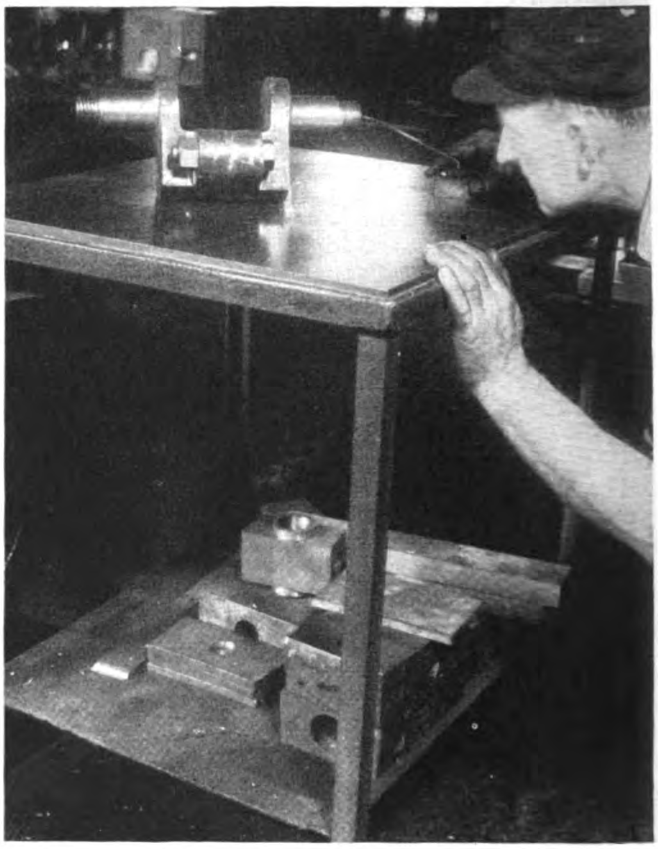
Q.—Could you suggest a method of welding that would keep the rivets in coupler yokes from working loose?

A.—Welding can and will keep coupler-yoke rivets from working loose. The junction of the coupler yoke and the shank is either chipped out or cut out with the torch deep enough to take a good bead of coated rod about ½ in. deep. The gouging nozzle works well for this job, also the ¼-in. size rod.

Plate and Angle Layout Table

Q.—Can you suggest a design for a layout table that can be fabricated by welding?

A.—The table shown in the accompanying illustration is used exclusively for fine laying-out work. The top is made from two pieces of 1 in. by 12 in. by 24 in. welded together to form a surface 24 in. square. This plate was



Layout table fabricated by welding

machined all over and the top divided, with a pointed tool, into 4 in. squares. A ¾-in. angle frame was bent and welded to hold this plate. Legs of 1-in. angle were welded to the frame at the corners and a brace made of ¼-in. plate welded to the legs. The table was shimmed and leveled and the ends of the legs leaded in position. The top was placed in the frame, made absolutely level and leaded to hold it securely.

Gas Cutting and Welding Practices

Production of oxygen for industrial uses increased to 7,181,479 million cubic feet in 1941, compared with the 1939 output of 4,561,968 cu. ft. This was a 57.4 per cent increase. With the increased demands of war industries, particularly shipbuilding, it is expected that the 1942 production must be very much greater than that in 1941. Limitations in plant facilities and inadequacy of the present supply of compressed-gas cylinders has imposed a burden upon the companies furnishing compressed gases which they are endeavoring to meet to the best of their abilities. To date there has been no shortage but the Air Reduction Sales Company, recognizing the necessity of using every possible method to insure adequate supplies to all consumers, has instituted a campaign through its own representatives and by publicity to get maximum utilization of all gases with the greatest economy in shop practices.

Oversize tips waste gas

A check in one shop disclosed that 25 per cent of the oxygen purchased was being wasted through an accumulation of "insignificant" losses. Many of the practices observed might have been disregarded in peacetime but can only be considered wasteful and subject to correction now. Some of the things in which correction is desired will appear trivial to men who, over a period of years, have become accustomed to the practices in normal shop operations.

It can be pointed out that the use of a No. 2 cutting tip instead of a No. 1 on ½-in. plate consumes 10 to 20 per cent more oxygen and 16 per cent more acetylene than is needed. All of this is waste.

Excessive Pressures

One of the most common causes of waste, especially by inexperienced operators, is the use of pressures higher than those recommended by the manufacturers. When greater speed in cutting is desired the answer lies in the use of high-speed tips which do not consume additional oxygen. Another factor which requires the use of higher pressures to do regular work is the use of unnecessarily long lengths of hose or hose of too small a diameter. In the first case excessive pressures must be used to overcome line drop, in the other it must be used to force through a sufficient volume of gases to do the necessary work. In addition to being wasteful excessive pressures are very likely to cause leaks in the hose lines and result in even greater losses.

Torches and Tips

It is an old rule, and one which many men will claim is closely observed in their shops, which requires that no torch shall be burning if it is not in use. Three minutes of burning time in each working hour wastes five per cent of the gas consumption if those three minutes are not spent in productive work. Five per cent of the 1941 oxygen consumption was 360 million cubic feet, 1,636,000 normal cylinders.

Hose

With the present critical shortage in materials made from rubber it is important that hose be made to last as long as possible. It must be prevented from mistreatment which will cause leaks, kept away from hot oxides and sparks, free of oil and grease, protected at truck crossings by bridging, and, when damaged, repaired by cutting out the defective portions and splicing with standard splicing nipples. Excess hose should be stored in a cool, dark place to retard deterioration.

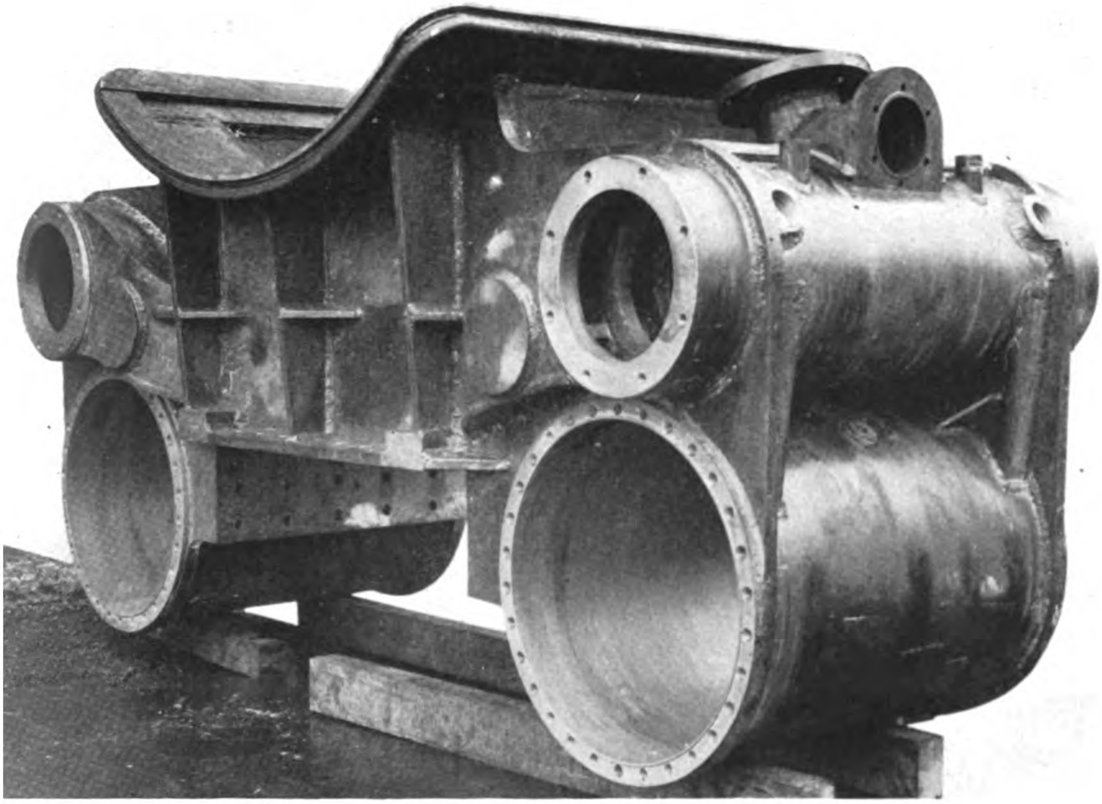
Cylinders

The present supply of compressed-gas cylinders is hardly sufficient for today's needs. Cylinders should be carefully handled to prevent damage, fully emptied, by manifolding if necessary, and returned to the manufacturer at the earliest possible moment. The maintenance of large reserve stocks is to be discouraged and greater dependence must be placed upon rapid turnover to keep all users currently supplied with their needs.

Maker-User Cooperation

This campaign is instituted by manufacturers of gases to insure the continuing supplies of their products to all industries which need them. It is expected that the campaign will be further extended by the issuance of shop posters, advertising and correspondence.

Use proper working pressures and close cylinder valves when finished



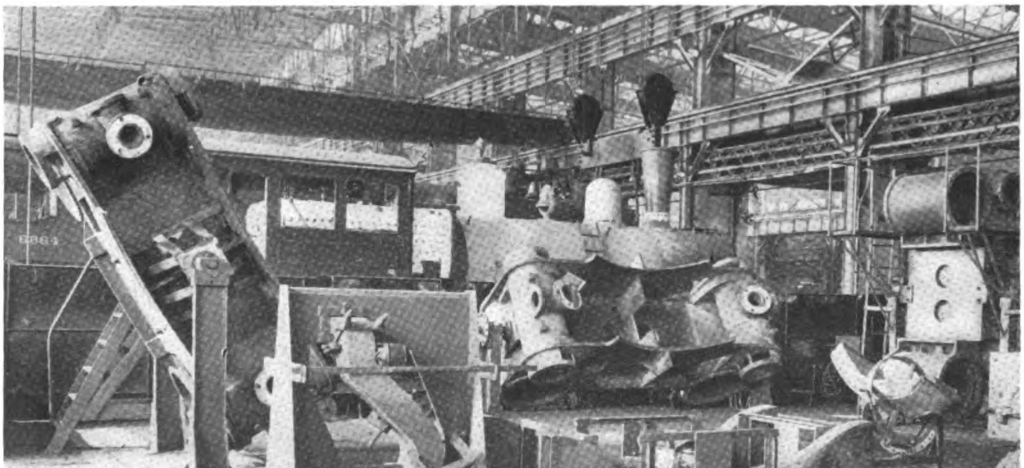
The steam locomotive cylinder offers one of the outstanding examples of the possibilities of fabrication by the welding process. To do this job required almost 200 separate pieces of steel of 50 shapes

Fabrication By Welding

THE recorded history of welding practice, particularly in the railroad shop, is not too clear on the point of just where and how the idea of building up parts entirely by welding originated but it is fairly safe to assume that the idea got its start as the result of a broken casting for which there was no pattern immediately available. Whatever may have been its origin the idea has spread rapidly until now, in the railroad field, fabricated welded structures, or weldments, range in size all the way from the smallest brackets up to massive parts such as cylinders for locomotives, underframes for locomotives and cars, locomotive cabs, car bodies and truck frames.

Welded structures have numerous advantages from the standpoint of strength and reduction in weight and, these days, when it is not always possible to secure castings, particularly large ones when they are required for emergency repairs, the welded structure solves the problem and keeps equipment in service that might otherwise be idle.

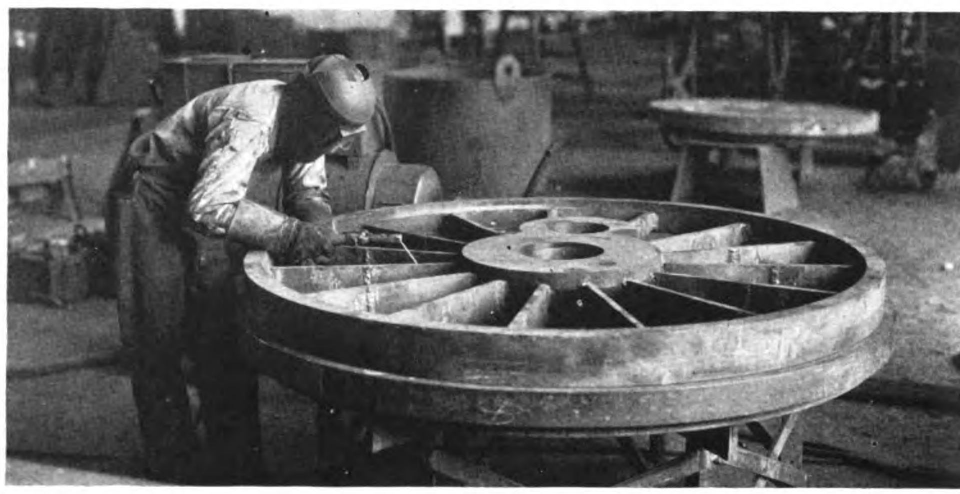
From the standpoint of the size of the part and complicity of structure the all-welded locomotive cylinder

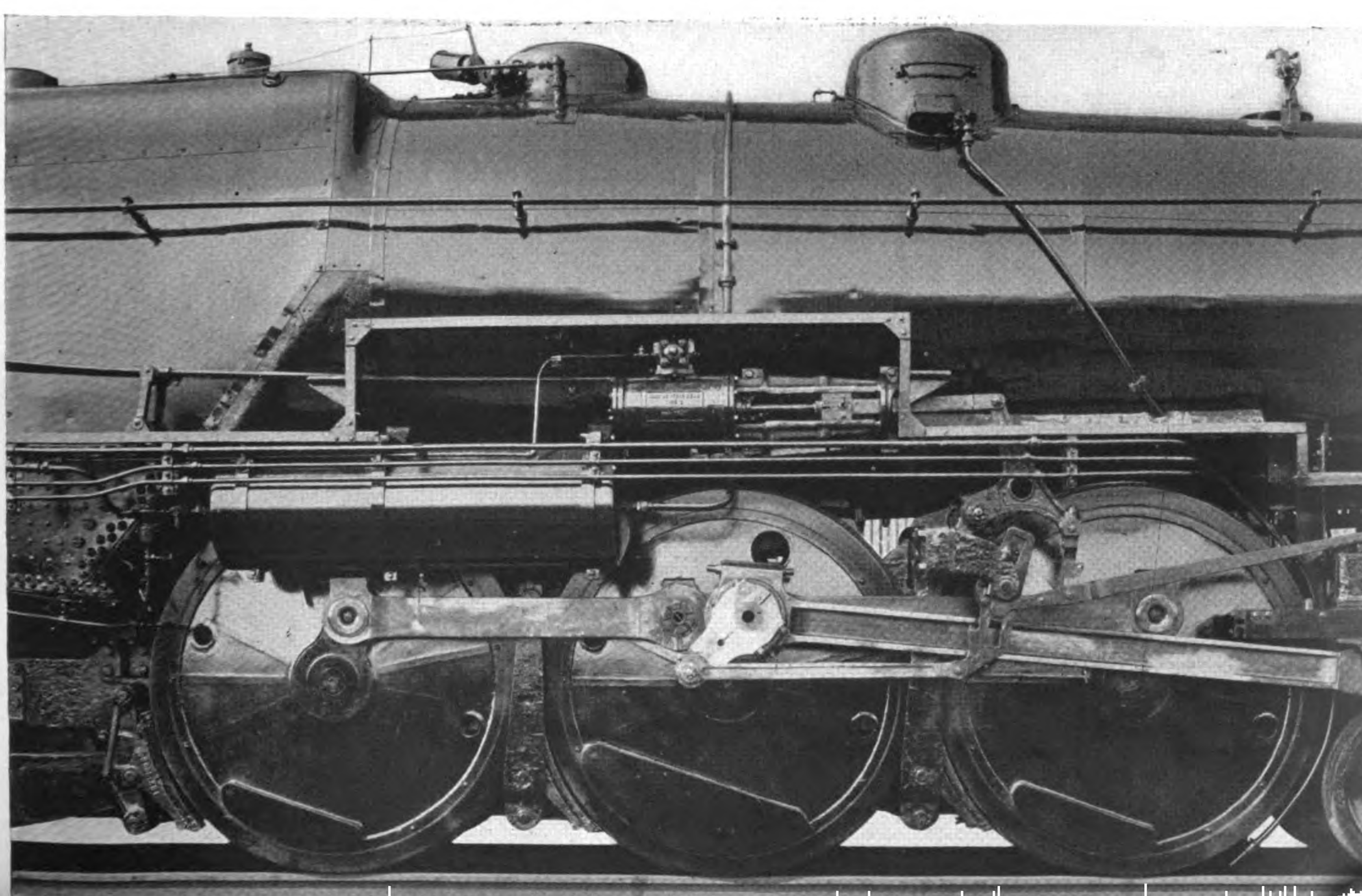


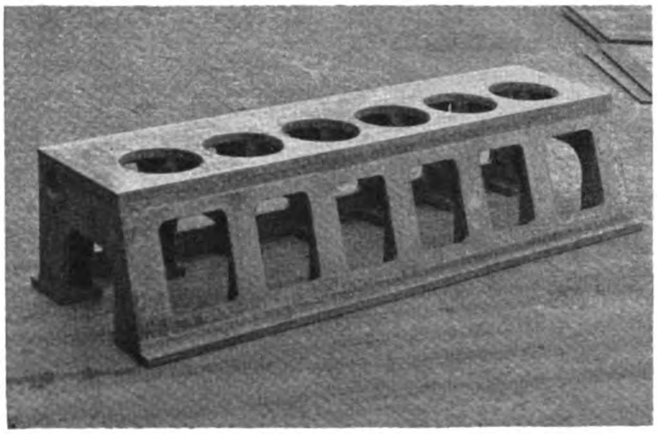
In order to maintain alignment of parts and simplify the production of cylinders by welding a number of jigs and fixtures are required. The shop set-up for three cylinder-welding operations are shown in this photograph

Fabricated assemblies for freight and passenger car work offer an opportunity to speed up operations. A welding jig for a freight car bolster is shown here

In the photographs at the right and below are shown a welded fabricated driving wheel in the process of being assembled in the shop and the final result as it appears on the engine







Car and Locomotive Parts Fabricated by Welding

PASSENGER CAR PARTS:

- Face plate upper buffer spring bracket
- Truck equalizer guides
- Outside seat for semi-elliptical springs
- Outside brake head guides, on end rails
- Coupler stem supports
- Trucks, combined bolster guides, spring carrier and brake hanger, outside brackets
- Flexible gear centers for truck
- Roller bearing boxes and housings
- Draft gear pockets

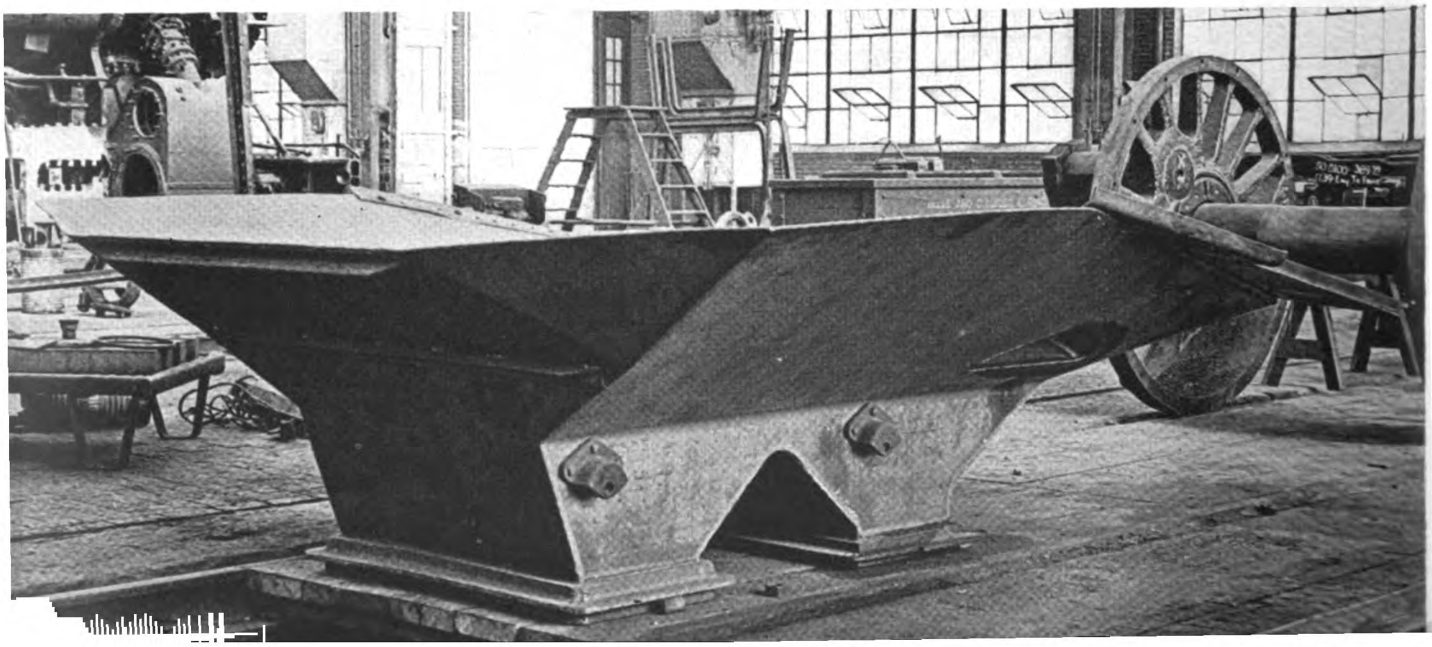
FREIGHT CAR PARTS:

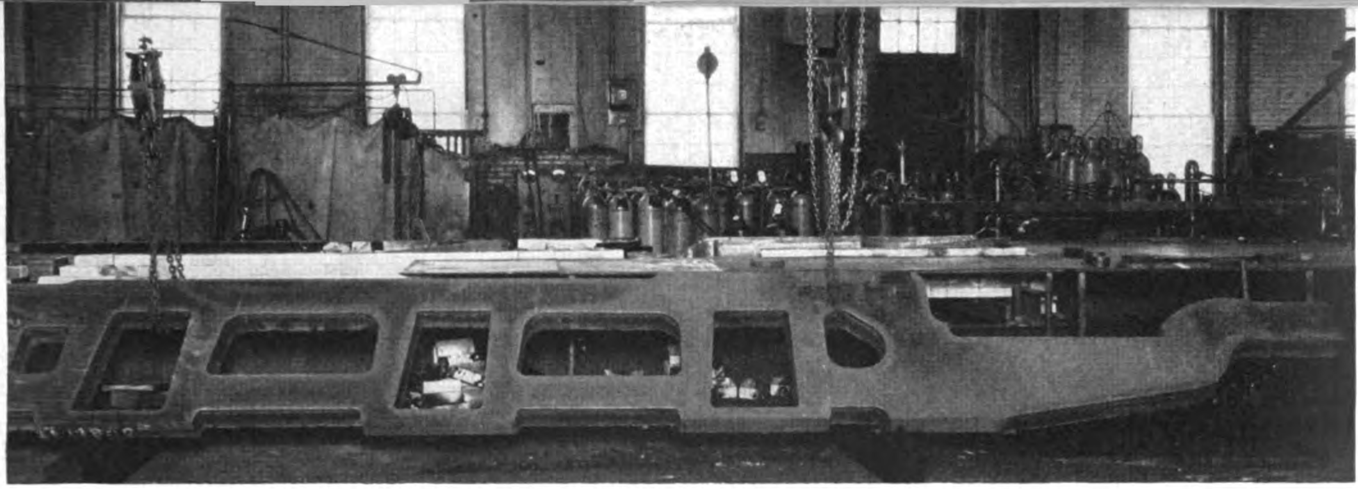
- Center plate reinforcement and rear draft lugs
- Striking plates
- Coupler carriers
- Corner posts for drop-end gondola cars
- Bolster and crossbearer side stakes—gondola cars
- End door framing and side door posts—auto box cars
- Center sill separators
- Side bearings and braces
- Truck dead lever fulcrum bracket
- Body bolsters and hopper door frames for cement cars
- Truck frames
- Complete underframes
- Car roofs

LOCOMOTIVE PARTS:

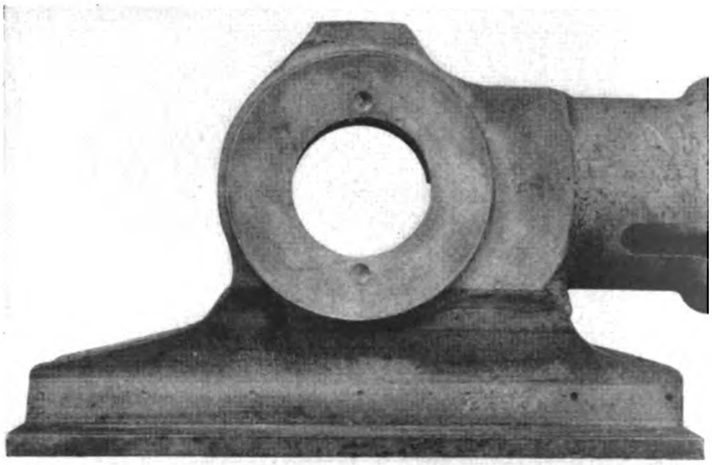
- Main steam cylinders
- Crossheads and pistons
- Driving wheel centers
- Guide yokes
- Driving spring stirrups and spring clips
- Main steam and exhaust pipes to cylinders
- Feedwater heater exhaust steam pipes
- Pilot with drop coupler
- Frame stiffening pieces
- Expansion plate attachment on main frames
- Front frame center piece
- Bracket for supporting stoker casting
- Boiler foundation ring
- Ash pan complete with hopper frames and doors
- Power reverse gear support brackets
- Lubricator support brackets
- Driver brake hanger
- Air compressor brackets
- Link and link shaft brackets
- Cab deck crosstie and support
- Blower motor support brackets
- Booster engine brackets
- Bolsters for electric locomotives
- Trailer truck roller caps
- Crank cases for gasoline rail car engines
- Tender truck center plates
- Coupler pocket extensions
- Chafing block extensions
- Smoke stacks and draft pipes

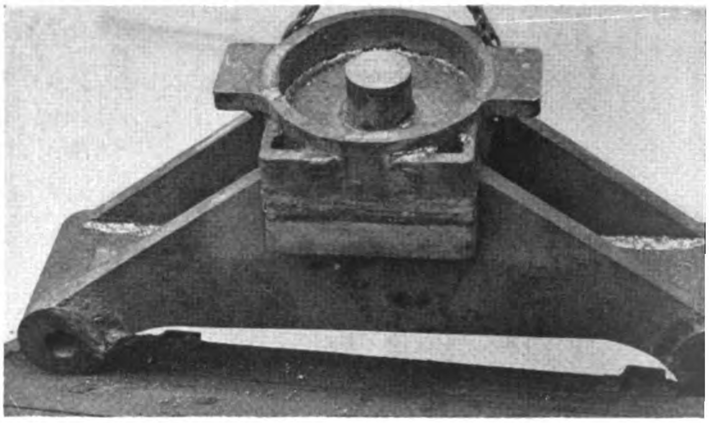
The list which appears on this page is but an indication of the many jobs in which fabrication by welding can play a part. Of the parts relating to locomotive valve gear there are several such as the bell crank in the top illustration that can be produced by this method. The photograph directly above shows what can be done in an emergency to return the gasoline engine of a rail car to service by fabricating a new crank case. The lower photograph is an ash pan

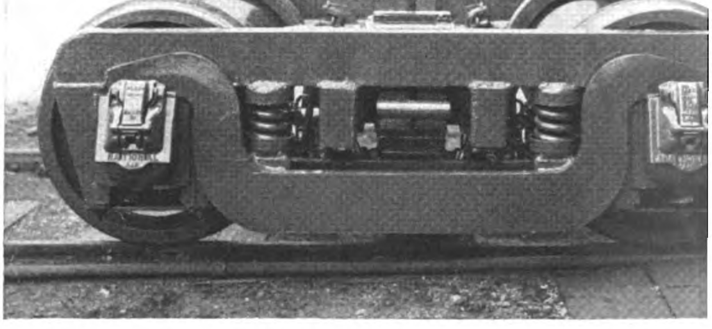




The entire locomotive frame or bed structure, one side rail of which is shown at the top of the page, is an example of the type of parts in which the welding process can be utilized to advantage to eliminate many of the connections that have always given trouble when bolted together. Of the three welded jobs shown at the right of the page the upper is a locomotive crosshead, the center a truck bolster and the lower a welded truck





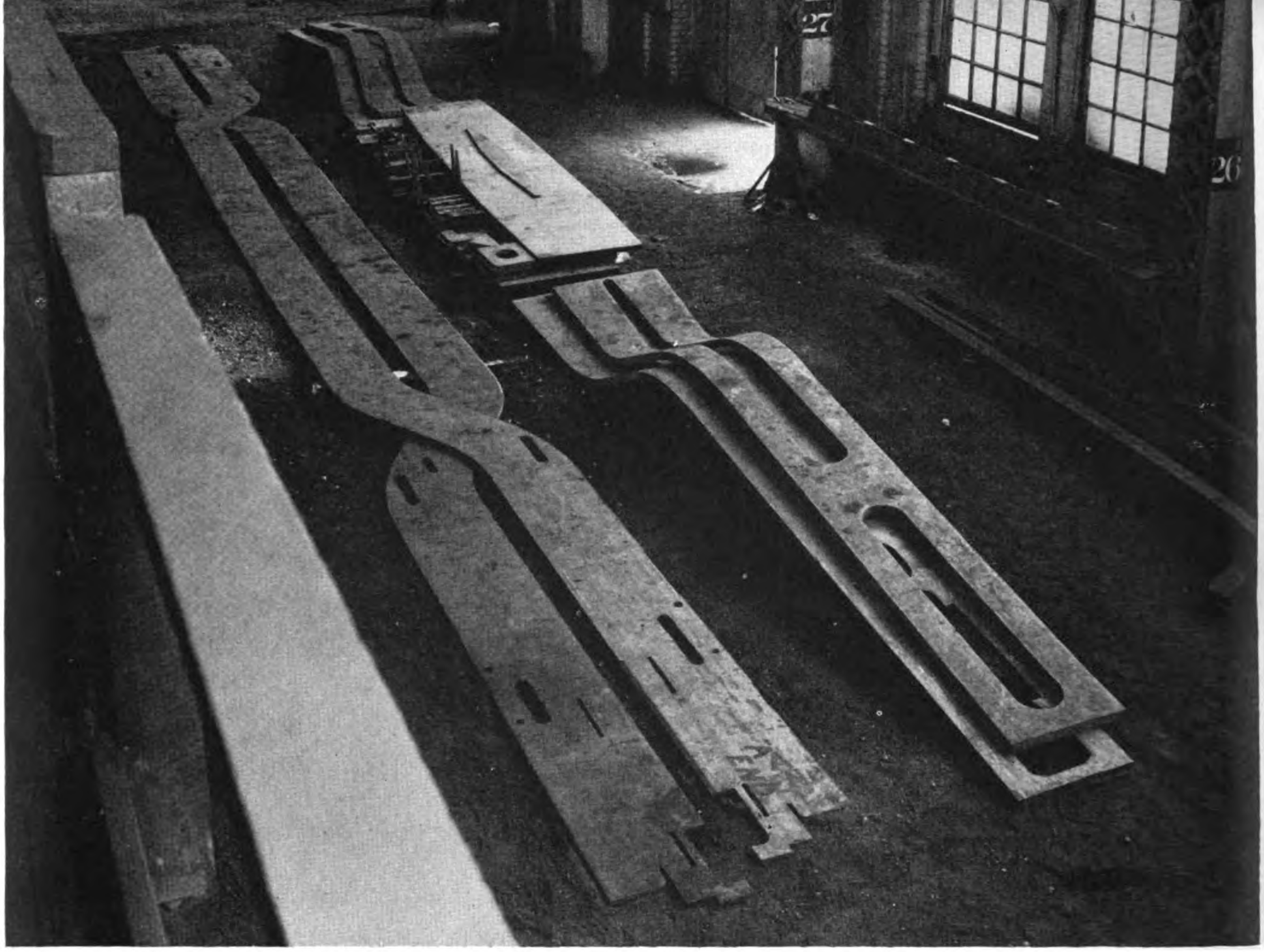


takes a front rank in point of interest. Two of the illustrations accompanying this article show one of the completed cylinder sets and the jigs and fixtures on which they are made. The entire assembly, a pair of cylinders with saddles, ports and valve chambers, involves the use of almost 200 pieces of steel of over 50 different shapes, all of which are cut by means of the gas cutting machine. The barrels are rolled into shape and have single longitudinal seams.

Each complete cylinder requires over 1,200 linear feet of welding and the use of over a ton of welding wire. All of the parts of the cylinders are made of flange steel and after the welding is completed the entire assembly is stress-relieved for a period of about five hours. In the actual job of fabricating a structure as complicated as a cylinder there is a major problem of maintaining alignment and holding the finished assembly to dimension. This is accomplished by holding the work to extremely close tolerances and by making the proper allowances for contraction upon cooling of the welds. The saving in weight of these welded cylinders, as compared with the conventional cast cylinder, is in the neighborhood of 5,000 lb.

Another example of the welded structure of unusual size is that of a 90-ft. well car having a total weight of 314,000 lb. in which approximately two-thirds of the total weight is in welded assembly. The body of this car (described in the April 26, 1941, issue of Railway Age) was made up of seven H beams 18¾ in. deep and over 58 feet long. These massive beams were in turn built up of five separate members butt welded by the Thermit process. The individual beam members were built up by welding the top and bottom flanges to form the H beams and the seven completed individual beam members were then welded together at the edges of the flanges to form the continuous platform of the car. Some idea of the magnitude of this welding job can be gained from the fact that 8,000 lb. of thermit and 7,800 lb. of electrodes were used. There were over 38,000 linear feet of ¼-in. bead welding and 1,400 welding man-hours involved in this car job.

On these four pages are shown some typical examples of freight and passenger car and locomotive parts that have been fabricated by welding on a number of different railroads. In the table on page 264 there are a number of jobs of this type in addition to the examples shown in the photographs. This list is not by any means complete but it does contain such jobs as were actually reported by a number of roads in a limited survey.



Machine Gas Cutting

THE introduction of the oxyacetylene gas cutting machine into the railroad shop several years ago opened up a new field for the production of many locomotive and car parts in quantity. Some idea of the scope of usefulness of the cutting machine may be gained from the fact that lists compiled from many different railroad sources show that well over 300 different items used in railroad work many now be made wholly or in part by this method.

The size of parts that can be cut out may, for all practical purposes, be said to be limited only by the size of the table of the machine and the number of parts produced at a time bears a direct relation to the type of part and the number of cutting heads on the machine. Naturally, parts such as washers which may be cut from plate by the stack cutting method may, with a multiple-head machine be turned out in great quantity while a more complicated part, cut from a forged billet of 10 or 12 in. thickness will be limited in quantity. These examples are mentioned to show the wide range of possibilities in machine cutting.

Now that the fabrication of welded assemblies such as locomotive cylinders, air-compressor brackets, car-truck and body bolsters, cabs, driving wheels, crossheads, guide yokes, steam and exhaust pipes, pilots, etc., is progressing at such a rapid pace it is worth while pointing out that the facility with which this fabricated assembly work is done is not only greatly augmented but in many cases actually made possible by the use of the gas cutting machine. Two outstanding examples of this type of work are shown on these pages and reference to the article on fabrication by welding on page 262 of this issue will readily make plain to the reader the important part which the gas cutting machine now plays in this type of car and locomotive parts production by the welding method.

The accompanying illustration of the many parts that are necessary to make a single pair of welded locomotive steam cylinders shows what an important factor the cutting machine was in the job. In this group of almost 200 pieces there are over 50 different shapes and while it may not be entirely correct to say that they could not be produced by any other method it is safe to assume that the cost of so doing would be prohibitive.

Not the least of the cutting machine's advantages is

Some idea of the size of gas machine cut parts in railroad work may be gained from the illustration at the top of this page which shows several of the members of fabricated welded sills for a large well-type car. Where a variety of shapes of relatively small size are involved the group of parts for a welded locomotive cylinder on the opposite page shows the flexibility of the machine method. The third photograph shows washers being cut by machine

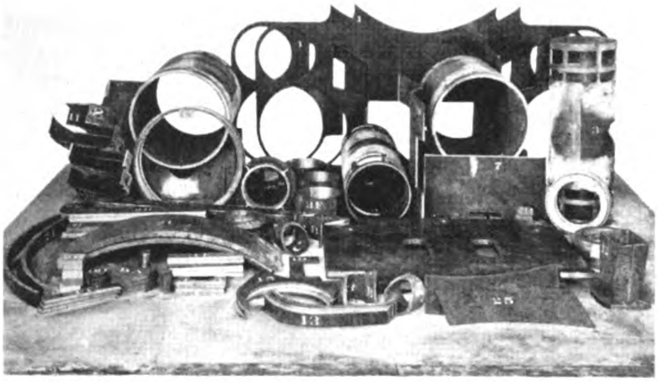
Typical Examples of Railroad Shape Cutting

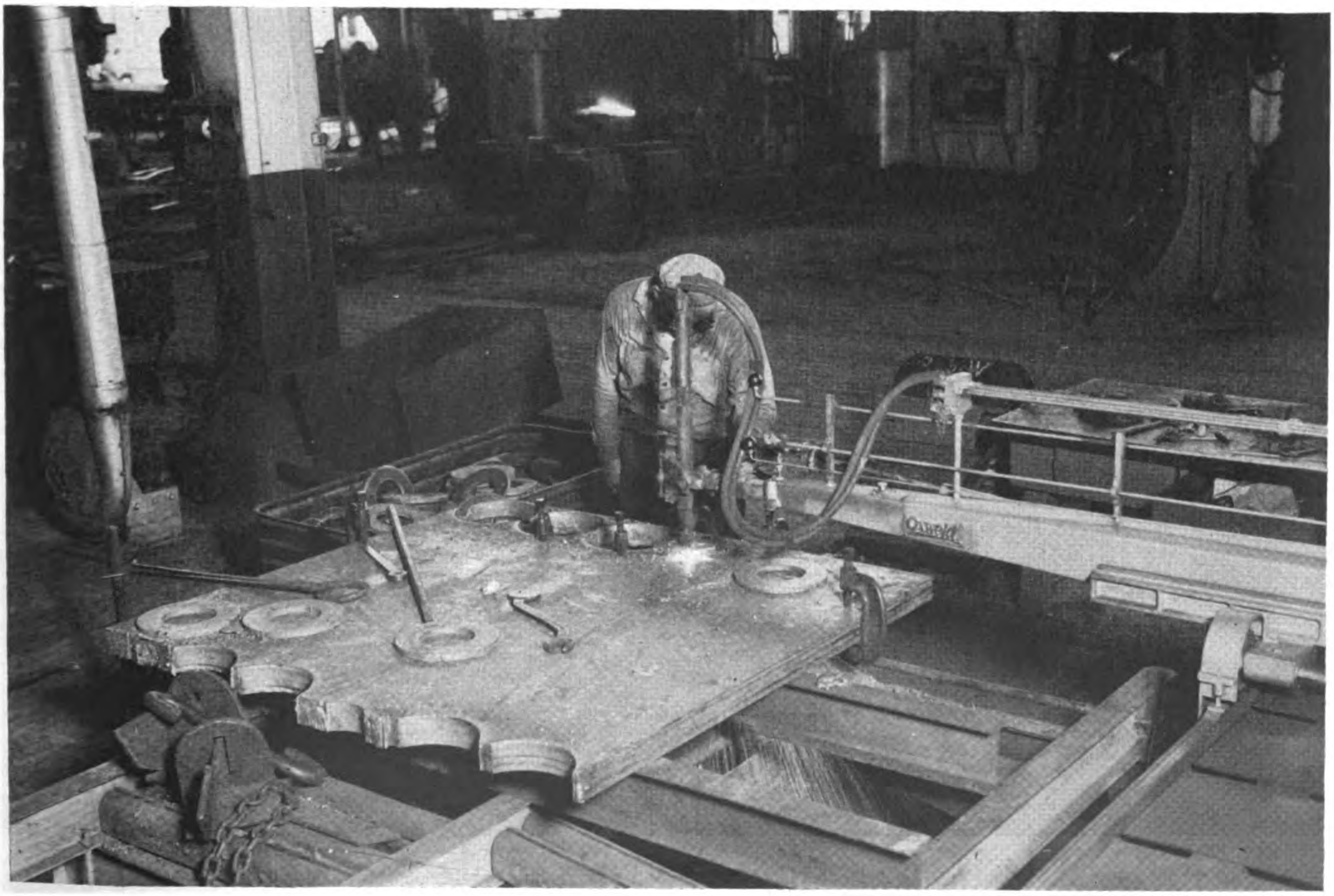
Blow-off muffler
Boiler supports
Box car door track support
Buffer tread plates
Coal gate hinges
Crosshead bodies
Cylinder cock rigging
Cylinder head casings
Deck wind sheets
Diaphragm face plate
Draft gear pockets
Drawgear pin keeper
Driving boxes
Engine truck rocker bearings
Expansion plate liners
Firedoor pedal supports
Generator cable brackets
Grate shaker lever lock
Grate shaker rod shield
Handhole plates
Hub liners
Link motion parts
Locomotive frame sections
Main and side rods
Pipe flanges and clamp brackets
Reversing shafts and gear brackets
Runboard, sand box, and smokebox steps
Spring equalizers
Spring plank ends and ribs
Steam and air gage plates
Superheater header cover plate
Tank valve strainers
Tender brake retaining plate
Throttle lever and quadrant bracket
Truck pedestals
Valve rod support
Vestibule steps
Waist sheet frames
Waist sheet link support
Water scoop piston rod jaw

the ability to cut out parts to such close tolerances and with such smoothness as to surface that the part may be placed in service without any subsequent finishing by machining or otherwise. The degree of accuracy depends largely on the grade and thickness of the material and the intricacy of the shape. Where no finish is required ordinary steel plate may be cut right to the finish line. On high-carbon steels, where machining is to be done, only a finish tolerance need be left and this may be allowed for on the drawing or template.

The illustration at the head of this article shows machine-cut members for the underframe of a well car. This is an example of a relatively simple part of large size.

The accompanying table is far from complete; it includes many of the more important machine-cut parts.



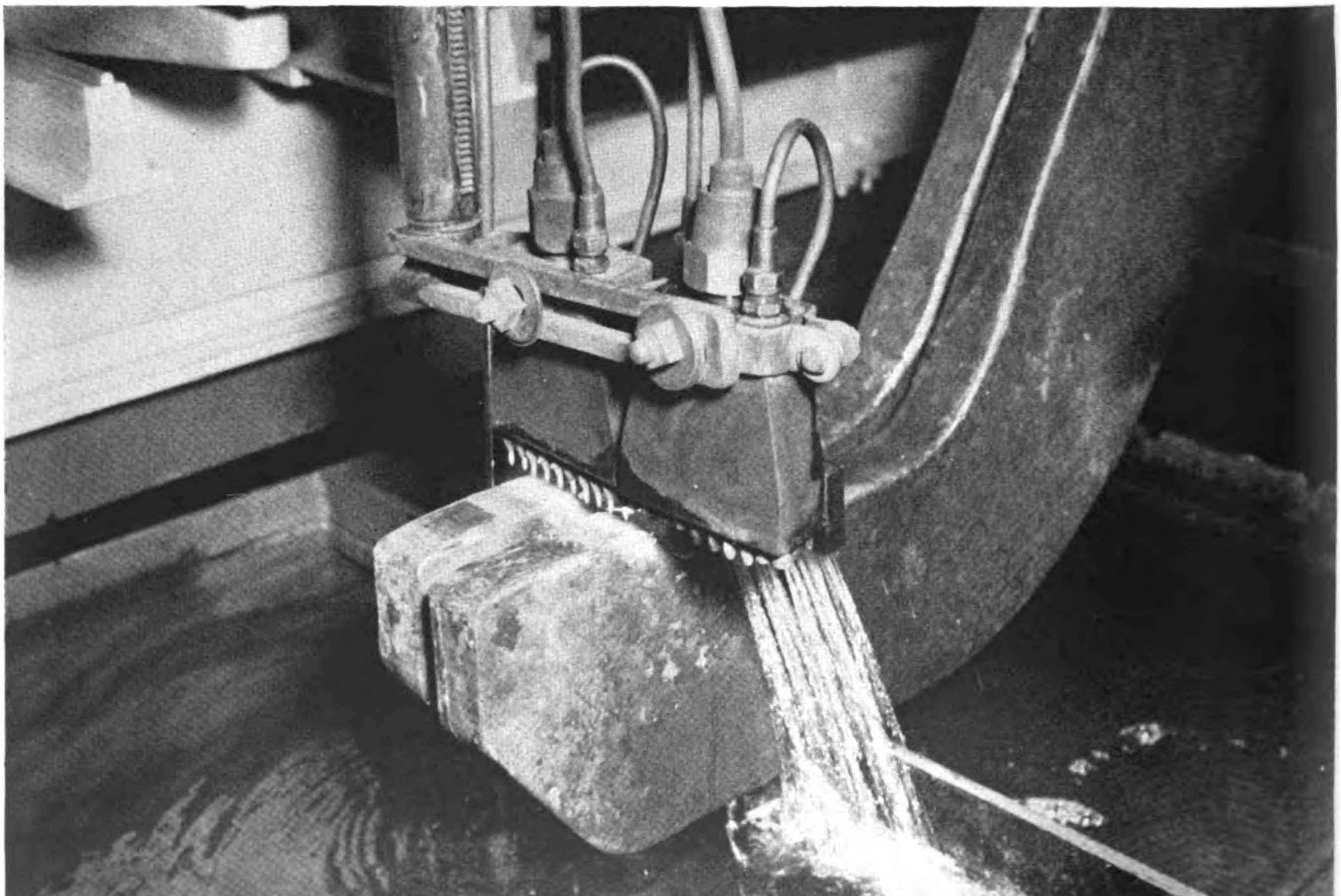


Flame Hardening

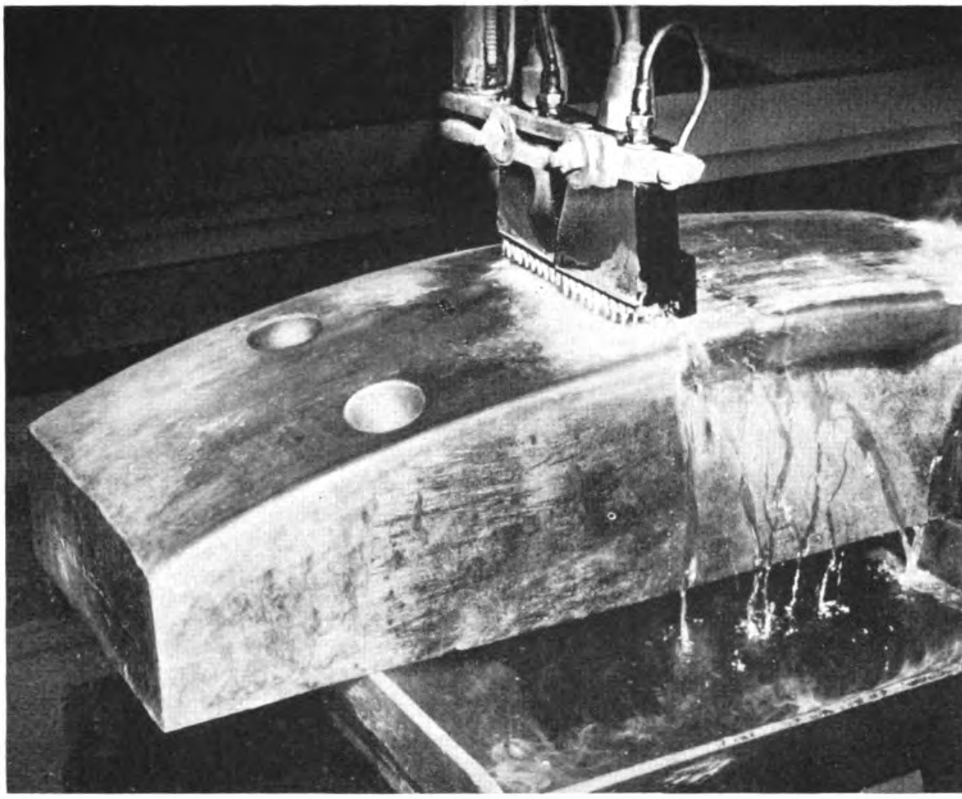
THE hardening of parts made of ferrous materials by the use of the oxyacetylene flame is not new in the railroad field for it was in the hardening of rail ends by this method that the first large-scale use of the process was initiated. This was about 15 years ago and since then the development of apparatus for industrial use has resulted in a steadily broadening scope of applications. As a result of this development the process is rapidly finding its way into the railroad shop for use in connection with a variety of car and locomotive parts.

The flame hardening process is especially useful in the hardening of localized areas on parts of large section which might not be hardened by the furnace method because of the dangers of distortion. It also finds a field of usefulness in the hardening of small parts that are not used in sufficient quantity to warrant the more expensive furnace process. A great many of the parts that are now being hardened by the flame method in railroad shops are parts that were not previously hardened by any process at all. Among examples of this character are locomotive guides, Walschaert motion links and link blocks, valve rod crossheads, truck box pedestal faces, spring saddles, frame shoes and wedges, tender chafing castings, stoker gears, stoker racks, stoker elevator screws, journal box equalizer seats, center buffer stems for passenger and baggage cars, truck equalizers, generator pulleys, journal box wedges, cast steel driving box cellars, cross spring equalizer bearings and brake shoe heads. The parts mentioned above give an excellent idea of the possibilities in the use of the process which can result not only in improved service from the parts in question but a materially longer service life.

While, as it has been pointed out, the majority of the applications in car and locomotive work have been of a nature that surface hardening by any practicable means was not possible prior to the introduction of the flame method there is the important factor of time. In other words, were it physically possible to harden some of the parts in question by another method the actual time required by the flame method is so short and the resultant cost so low that these factors alone open up a new field for its use in railroad work. Some idea of the time required may be gained from a few examples. Take the case of a Walschaert motion link where the surfaces in contact with the link block were hardened by the flame method. This case involved the hardening of



Flame hardening the ends of a pair of truck equalizers



The curved surface of a radial chafing block is an interesting hardening operation

Flame-Hardened Car and Locomotive Parts

	Brinell Hardness Before	Brinell Hardness After	Area Hardened Sq. in.	Oxygen used Cu. ft.	Acetylene used Cu. ft.
Buffer spring cap	275	550	31.5	9.3	9.3
Quill spring cap	300	550	17.5	5.3	5.3
Cab centering bracket	250	500	36.0	9.5	9.5
Buffer wearing pad	230	475	28.0	9.3	9.3
Cab bearer	250	600	8.9	6.2	6.2
Driving box cellar	180	400	19.5	3.0	3.0
Driving box wedge	180	450	172.1	53.1	53.1
Cross spring equalizer bearing	250	400	7.9	2.0	2.0
Brake beam head	230	400	4.5	1.7	1.7
Buffer center stem	300	600	8.9	2.4	2.4
Diesel frame rocker casting	210	250	55.8	19.0	19.0
Truck box—engine	217	450	175.0	26.0	26.0
Truck box—engine	170	350	23.0	5.0	5.0
Link block	250	500	39.0	8.0	8.0
Valve crosshead	217	550	92.0	14.0	14.0
Guide	197	550	709.4	198.0	198.0
Guide	217	500	744.3	218.0	218.0
Chafing casting (floating)	240	350	182.0	80.0	80.0
Chafing casting	250	350	162.0	50.0	50.0
Chafing casting—tender side	200	400	168.0	65.0	65.0
Spring saddle	217-255	429	44.0	12.0	12.0
Spring saddle	217-255	360-480	44.0	12.0	12.0
Spring saddle	180	450	35.8	13.8	13.8
Buffer stem	200	400	46.0	13.0	13.0
Center stem buffer block	200	400	30.0	9.0	9.0
Center buffer stem	270	450	10.0	3.0	3.0
Journal box	200	350	36.0	7.0	7.0
Crowned generator pulley	150	375	100.0	23.0	23.0
Journal box wedge	140	300	28.0	9.0	9.0
Journal box	180	300	36.0	7.0	7.0
Crowned generator pulley	150	300	84.0	19.0	19.0
Equalizer	200	450	33.0	6.0	6.0

144 sq. in. of surface and the actual hardening time was only 15 min. On the companion link block 38 sq. in. were hardened in 2 min. A valve rod crosshead required the hardening of 92 sq. in. and the hardening time was 5½ min. On a truck box the face and sides of the pedestal fit were hardened over a total area of 175 sq. in. and the hardening time was 11 min.

Locomotive Guides

Locomotive guides present an interesting example of the use of the process. In one case where the guides were made of axle steel a pair of guides 73 in. long were hardened for a distance of 57 in., on both the face and the side of the bar. Each of two guides required the hardening of 827 sq. in. of surface. This was accomplished by hardening the faces of the bars in a horizontal position and then the two guides were laid face to face and the sides hardened. In the case of long pieces such as these guides there is the problem of bowing and this is handled by heating the reverse side from the face to eliminate the bowing. The heating for hardening on these guides was at the rate of 6½ in. per minute and the straightening speed was 9 in. per min. The actual hardening time in this case was about 18 min. per guide.

The accompanying table shows a number of examples of car and locomotive work with hardening data.

EDITORIALS

Welding in Railroad Shops

Welding is an important tool of industry; some call it the most important present-day tool. While still in its infancy it was adopted by the railroad shops as an answer to many of the repair problems with which they were faced. More recently it has taken its place as an indispensable aid in the reclamation and repair of car and locomotive parts that would, in earlier years, have found their way to the scrap pile. Freight and passenger cars, streamlined and conventional, are now assembled as almost completely welded structures. An all-welded locomotive boiler has proved so successful in nearly five years of operation that permission has been granted for the construction of more of such boilers when the plant facilities of locomotive builders, now engaged in defense work together with their locomotive building, can be used for erecting them. Weldments are replacing built-up riveted structures and steel castings in the designing of new rolling stock and motive power. Welding's "future" has arrived on the railroads.

Restrictions Are Relatively Few

Railroad welding practices are restricted in part by rulings of the Interstate Commerce Commission and by Interchange Rule No. 23 of the Association of American Railroads. Trial and error methods in railroad shops have resulted in additional prohibitions against welding which vary widely from railroad to railroad. A list of such legal, interchange and railroad adopted prohibitions indicates that the restrictions on welding are not many when compared with the number of parts on which welding is permitted on both cars and locomotives. A good general picture of railroad welding can be obtained from a study of these lists in connection with the article contributed by an engineer of tests of a large railway system.

Most spectacular of the welding applications have been in the construction of many of the streamlined trains placed in operation in recent years. Far more interesting as an engineering development has been the service performance record of an all-welded locomotive boiler. A new field of locomotive design might conceivably result as new engines are built carrying welded boilers.

Shape Cutting and Flame Hardening

Shape-cutting has established itself as a needed auxiliary to welding in shops which are increasing the use of welded structures in car and locomotive maintenance and repair. By itself it is important in speeding many shop operations through the elimination of repetitive machine work. Stack cutting and the use of multiple heads on cutting operations are helping shops meet schedules.

Not yet widely used, but offering interesting possibilities, flame hardening of parts subjected to wear is being tried out by a number of railroads. Welding is commonly used for the building up of worn surfaces; flame-hardening, where it can be successfully applied, aims at diminishing wear and reduction of areas on parts which are subjected to chafing or other wearing movement.

Welding has grown on the railroads; it is proving its worth more and more in these times of material shortages and delayed deliveries. How well its growth has been guided is not readily apparent. Almost four hundred parts are known to be welded in railroad shops today. The list given can probably be extended by several more hundreds but it must be remembered that not all railroads perform all of the operations shown. Some of the jobs named are performed on only one of the eleven railroads studied; others are common practice on all.

Training Welders and Controlling Their Work

It is not clear whether managements and shop supervision are fully aware of the potentialities of this "tool" which has been in their shops for years. Wide variations in practice and the extent of its utilization are found on different roads. It would be dangerous and untrue to say that welding can be applied generally in maintenance and construction work. Applications should be made only after approval of competent, trained welding engineers or supervisors. Workmen too must be skillful; they must be familiar with the requirements of the completed job and with the technique of the best welding practices.

Welding operators cannot be made overnight as can riveters. An inspector's hammer will find the loose rivets in a job but a weld, unless too badly made, hides most of its defects within itself. Careful training and follow-up supervision is necessary in the development of qualified welding operators. Reluctance on the part of some to extend the range of welding applications in the railroad shops may be due to lack of understanding of the importance of having an adequate training program for operators. Failed welds should not be used as an argument against the use of welding if an operator was at fault. Established engineering and metallurgical principles will determine the nature of the parts which can be welded; only skilled operators can do a successful job.

Even Now A Choice Must Be Made

As this war takes shape it becomes apparent that shortages must inevitably develop with respect to many of the things we need. There are shortages of materials some of which are of a nature that can not, at the moment, be prevented. There are shortages of man power in industry that exist, in many cases, as a result of the lack of training programs in the skilled trades. In the railroad industry there are shortages of efficient facilities in shops and enginehouses because the lean earnings of the depression years didn't encourage modernization.

Inefficient facilities require the use of many man-hours that can be saved by modern equipment. It is possible to secure many needed items, even under present conditions, and to continue to permit an obsolete machine or tool to waste valuable man-power when it can be prevented is something that can not be excused under any conditions.

Tapping Human Resourcefulness

Contributors to the contest on making the best possible use of mechanical-department equipment and facilities, reported in our April issue, had a good bit to say about the possibilities of larger co-operation from the workers through the use of suggestion systems. These are now used quite effectively by several railroads. It is interesting to note that these articles, which were written several months ago, dovetail to a degree with the suggestion made more recently by Donald M. Nelson, chairman of the War Production Board, that joint committees be set up in each industrial plant, composed of representatives of employees and management, to suggest ways and means for increasing production.

Railroad men were not slow to point out that much the same sort of plan has been in effect for many years in the form of labor union-management co-operation on the Baltimore & Ohio and the Canadian National. In the 18 years during which this system has functioned on the Baltimore & Ohio 11,673 meetings have been held. More than 32,000 suggestions were made, of which 27,715 were adopted; 326 are still under consideration, and 1,205 were deferred because the expense involved was too great to warrant their consideration up to this time. Less than 3,000—actually 2,914—were dropped because they were not considered practical.

On the Canadian National the first meeting in the mechanical department was held in January, 1925. During the intervening period 27,105 suggestions have been made, over 83 per cent of which have been accepted.

Other railroads have approached this problem from different angles, sometimes with notable success. In other instances it has not worked out so well, possibly because it has not been approached in the right sort of spirit, for, after all, human nature is extremely sensitive and can easily be discouraged if conditions are not what it is felt they should be.

Is it not true that the greatest possibilities for increased production and capacity under the existing emergency conditions depend upon releasing the latent potentialities in the human element? Ought not more critical study and consideration be given to the problem of dealing successfully with this factor? We speak of the advantages of thorough, scientific research in order to develop and utilize materials and equipment to the utmost. Ought not the same thought and consideration be given to problems of supervision and effective management? What is your answer?

These thoughts and these questions are inspired by a paragraph in a letter from an executive of one of our great railway systems. Here is what he had to say after he had read our April issue: "I was very much impressed with several points. For example, the hunger of men for recognition—a simple 'well done' upon completion of a job. One fellow mentioned that he never had had a pat on the back, and another said that in thirteen years he had never heard of but one being given! Their testimonies are tragic. I recommend that you do an editorial on them."

Will not the adoption of some sort of a formal co-operative or suggestion system go a long way to improve such conditions and release pent-up abilities and ingenuity to the mutual benefit of all concerned—the public, the workers, the managements and the stockholders? And above all, to the winning of the war?

Waste Is Dangerous

Railroad shop workers and supervisors have grown accustomed over a period of years to having available, when needed, sufficient supplies of oxygen and acetylene to meet all requirements. Some attempt has always been made to utilize these gases in the most efficient and economical manner but their very abundance has permitted the growth of slackness in the observance of the least wasteful operating practices. With the constantly increasing demands recently, and the prospect of a further increase—it may reach 900 per cent over 1941 demands in the shipbuilding industry—the productive facilities of all manufacturers, extended though they have been, are likely to prove too small unless every user cooperates in a determined effort not to waste a single cubic foot of oxygen or acetylene. At the present time the manufacturers are developing educational campaigns to teach conservation through proper utilization and efficient working practices.

Railroads use huge quantities of both oxygen and acetylene in normal equipment maintenance and build-

ing operations. Now their demands have increased along with the demands of other defense industries. Unless the users take measures to help themselves by eliminating waste there is a grave possibility that the demands of all American industry which is enlisted in the war will exceed the maximum oxygen and acetylene productive capacity. Railroads cannot afford to be rationed on these vital gases of production if they are to keep up with their equipment-repair programs.

Elsewhere in this issue will be found suggestions of some of the ways in which the user can help.

A Hot-Weather Method For Reducing Lost Time

The demand for increased output of repair work in railway locomotive and car shops, as well as in enginehouses, during the coming months, will necessitate attention to every condition which has a bearing on the productive capacity of shop forces already depleted by the loss of a number of experienced men to the military services. Labor-saving machinery and shop devices are of major importance, but the physical comfort of men engaged in exacting operations is by no means to be ignored as a factor in their operation.

Practice having a favorable effect on output, as demonstrated by experience in a number of railway shops, is to provide salt in one form or another at drinking fountains where it will be available for the use of shopmen engaged in heavy, hot work. Attention was first called to this matter in 1934 when 17 cases of death attributable to heat were reported among men engaged in the construction of Boulder Dam. Scientific investigations at Boulder Dam and subsequently in steel mills indicate that salt is both a preventive and a cure for heat cramps and moreover, when maintained in the proper proportion in the human body, prevents slowing up, excessive fatigue, loss of energy and efficiency; which are common symptoms of overheating. Experiments indicate that workmen ordinarily drink from one to two gallons of water a day, dependent upon how high the temperature is and how hard they work, and that about eight 10-gr. salt tablets, or one teaspoonful of table salt, is required for each gallon of water consumed, to maintain the salt balance necessary for normal functioning of the body.

In some railway shops, granulated table salt is provided at drinking fountains; another method is to supply it in the form of small tablets which can be kept in containers or dispensers at drinking fountains.

A recent limited survey showed that five out of six large raliway shops have been using salt in one form or another with satisfactory results over a period of years. One shop superintendent reports that it is provided at all shops on the system; another says its use is particularly helpful in preventing heat prostration of men employed in close, confined places or on hot work; still another typical comment is quoted as follows: "We have been supplying salt tablets to all of our employees at shops and in the stores department during the summer months since 1936. The results have been very satisfactory. Our records show that formerly we had a few instances of employees being overheated, but no such cases have occurred since we provided salt tablets during the hot weather when men perspire freely."

New Books

MOTION STUDY. *By Herbert C. Sampter, Ph. B. Published by the Pitman Publishing Company, New York. 152 pages, 7 in. by 8 in. Price, $1.75.*

Motion Study is intended as a simple, concise statement of the basic principles of motion study in a broad sense. It contains certain basic principles of how to work most effectively in analyzing any work in order to improve the method. Emphasis is placed upon the use of flow process charts in the application of motion study to processes as a whole, and upon the application of motion study to the planning of new jobs rather than merely to the improvement of existing jobs. The book has thirteen chapters on general and overall motion study and its application; working area; therbligs; laws and principles; micromotion study; safety and fatigue, etc.

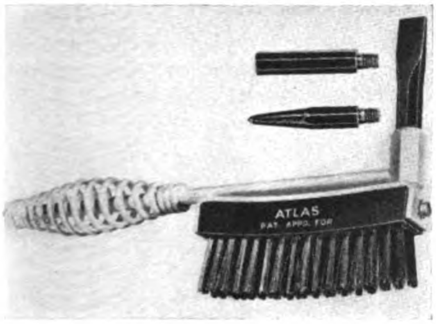
INDUSTRIAL SERIES. INDUSTRIAL SUPERVISION—ORGANIZATION; CONTROLS. *By Vernon G. Schaefer, Ph.D., and Willis Wissler, The Pennsylvania State College, and others. Price of each, $1.75.* SAFETY SUPERVISION. *By Vernon C. Schaefer. Price, $2.50. Published by the McGraw-Hill Book Company, Inc., New York. Each book 5 in by 7¼ in., bound in cloth.*

There are nine books in this series, each prepared under the direction of the Division of Engineering Extension, The Pennsylvania State College. Brief descriptions of the above three follow. *Industrial Supervision—Organization; Controls.* These books of ten chapters each are for the use of adult groups in industry and have been prepared to fill the needs of such groups while they are actively engaged in the work of industrial supervision. They are a thorough revision of all material at hand on the subject, including Foreman Training written in 1928 by George F. Mellen and revised in 1934 by Dr. Andrew Triche. New case studies are the contributions of industrial management, industrial psychology, and industrial economics. A shift in emphasis on supervisory training to the point where the problem of getting out production in the defense effort became paramount necessitated the present revisions. *Safety Supervision.*—A discussion in 14 chapters of the human element involved in the problems of the supervisor who must promote the safety of the workers in his division. The purpose of the book is to point out the necessity for, and some of the techniques in, good safety supervision, not to discuss engineering problems of safety or of conventional problems of making and keeping accident reports.

WELDING EQUIPMENT AND SUPPLIES

One Tool For Two Jobs

The Atlas Welding Accessories Company, Detroit, Mich., offers a combination tool with replaceable parts for weld cleaning. Ruggedly constructed, they combine a cleaning chisel and wire brush to speed up weld cleaning and eliminate the necessity of a welder putting down his cleaning chisel to pick up a wire brush to complete the slag cleaning operation incident to the use of covered electrodes in multiple-pass welding. The purchaser has a choice of cone, chisel or blunt cleaning bits.



Atlas weld cleaning tool with replaceable parts

Coated Aluminum-Bronze Electrodes

Ampco Metal, Inc., Milwaukee, Wis., manufactures a line of coated aluminum bronze weldrods covering a wide range of strength and hardness. The table gives the physical properties which may be expected from the deposited weld metal of these electrodes.

There are many possible applications for the various types of these electrodes on railway equipment. The use of Ampco-Trode 10 makes it possible to arc weld, instead of gas weld, manganese bronze and other copper alloys containing zinc. For arc welding with Ampco-Trode 10, it is necessary only to preheat these metals to 400 deg. or 500 deg. F., and then follow usual arc-welding practice. The wide range of hardness available in the other types of electrodes makes it possible to select the bronze most suitable for any type of service.

Physical Properties of Ampco Aluminum-Bronze Electrode

	Tensile strength, lb. per sq. in.	Yield strength, lb. per sq. in.	Elongation, per cent in 2 in.	Brinell hardness 3,000 KG-10 mm. Ball
Ampco-Trode 10	60-70,000	25-32,000	25-30	115-131
Ampco-Trode 12	65-75,000	25-29,000	22-27	109-124
Ampco-Trode 16	70-80,000	32-37,000	18-22	131-156
Ampco-Trode 18	77-85,000	34-40,000	10-14	159-183
Ampco-Trode 20	83-90,000	38-43,000	2-6	212-248
Ampco-Trode 21	70-80,000	42,000 min.	1-4	285-311
Ampco-Trode 22	70-85,000	45,000 min.	0-2	321-352

Flame Cleaning Before Painting

Flame cleaning and dehydrating of railroad equipment and cars is gaining in use through the recent introduction of a series of flame-cleaning heads and attachments by the Oxweld Railroad Service Company, Chicago, a unit of Union Carbide and Carbon Corporation. This oxyacetylene process, which is used before painting, removes loose paint, scale, and rust from steel surfaces, and at the same time drives out surface moisture so that the paint spreads more quickly and evenly and adheres more firmly. The use of flame cleaning helps in eliminating the major causes of subsequent corrosion and paint flaking.

Flame-cleaning heads are supplied in three widths: 2 in, 4 in. and 8 in. The 2-in. and 4-in. heads are used for general flame-cleaning operations and for close-quarter applications on underframes, equalizers and other small section members. The 8-in. head is specially designed for use on coach and car sides and similar surfaces where speed in cleaning large areas is desirable.

Oxy-acetylene flame-cleaning of a hopper-car side before applying paint

Construction of the heads is designed to give an even, neutral flame of high velocity from each orifice to provide uniform heating of the surface to be cleaned. Skids on each end of the head keep the flames positioned the correct distance from the surface of the metal. Mixer-tube assemblies of various capacities are used with the heads on standard welding blowpipes, and the length of the flame-cleaning equipment can be increased by means of extension tubes of from 6 in. to 20 in. The flame can thus be applied effectively from a height of about 8 ft. down to the ground or scaffold level with complete ease.

Atomic-Hydrogen Arc Welders

Atomic-hydrogen welders, manufactured by the General Electric Company, Schenectady, New York, are finding increasing use in industry for repairing tools and dies; for filling in flaws or blow-holes in steel and bronze castings; and for the fabrication and repair of hard-to-weld metals. The welders are compact and self-contained to reduce space requirements and to add to their portability.

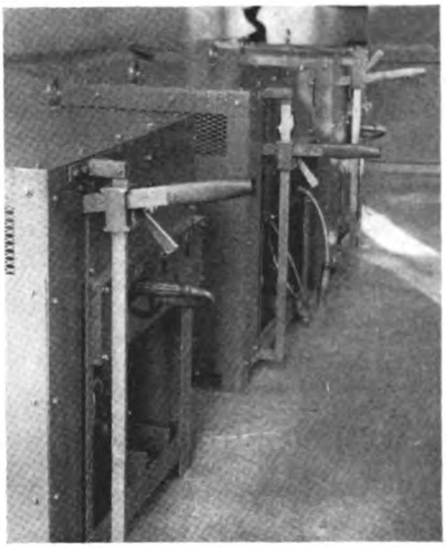
Instead of the transformer and reactor used in previous units, the new welder has a specially designed reactive transformer which combines the functions of both the transformer and reactor. As a result, the weight of the welder has been reduced more than 30 per cent, and electrical char-

G-E atomic hydrogen arc-welding transformer

acteristics improved. Built-in power-factor correction in these welders helps to reduce installation cost and avoid power-factor penalties. Forced ventilation provides cool operation, even at high currents or on high-duty cycles.

Multiple Units for Production Welding

Applying the air compressor multiple idea to quantity arc welding, Electric Arc, Inc., Newark, N. J., is producing multiple alter-



Double 300-amp. multiple star unit with d.c. pilot arc

nating-current welding units which provide service to more welders for the amperage rating of the machines than could be obtained through the use of individual installations. Each unit attached to the machine draws only the amount of power for which it is set to make a given weld. It is said that increased speed with arc blow eliminated is possible and that the use of heavier currents and larger electrodes will reduce the cost per pound of deposited weld metal.

With this system, a transformer with capacity to furnish the greatest demand for welding power is located outside the working space out of the way of workmen and equipment. This eliminates any danger from high-voltage cables lying on the working floor. A system of leads on the shop wall with outlets available at working points enables an operator, by the use of simple controls, to regulate both voltage and current to fit the needs of his job. Each station is independent of all others.

Amsco Saves Nickel

Cooperating in the national effort to conserve nickel wherever it is possible the American Manganese Steel Division of the American Brake Shoe & Foundry Co., New York, has developed an electrode for use in repairing fractures in manganese-steel parts which were formerly welded with nickel-manganese rods. It is said that the new alloy rod contains manganese and molybdenum with quantities of other elements and that it is satisfactory for substitution in place of nickel-manganese in almost every instance. Field tests indicate that it can be as readily applied and that it has a ductility and tensile strength equal to or better than the nickel-manganese. It can be used for building up parts as well as for repairing fractures.

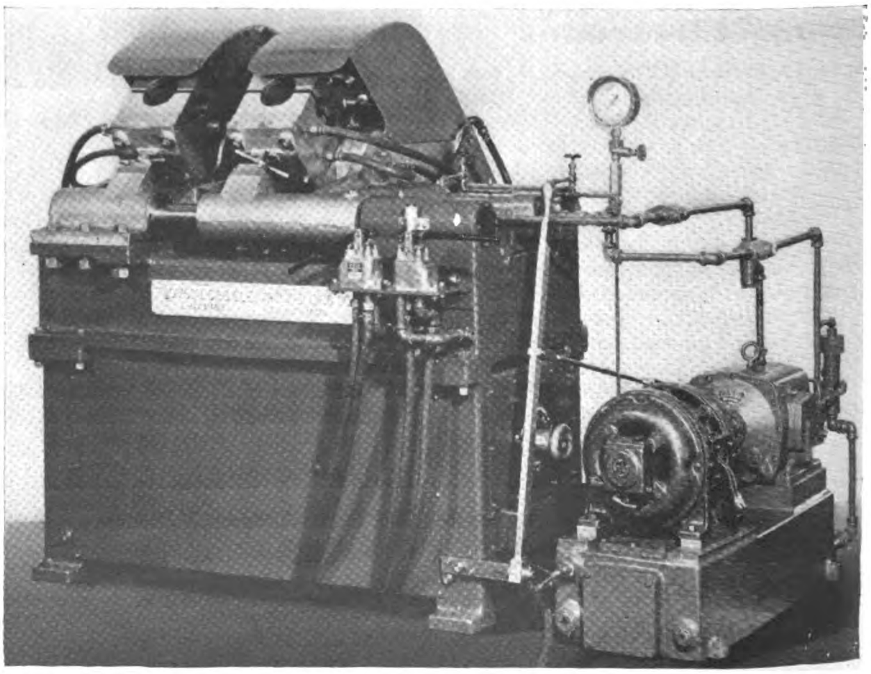
Flue Welder for The Railroad Shop

A flash welder for safe-ending and salvage work on locomotive boiler flues has been introduced by the Thomson-Gibb Electric Welding Co., Lynn, Mass. New features of design have been incorporated to make this machine—Model F-21—more useful in railroad flue welding shops. The 150-kva transformer is offset in the frame to provide a direct path for flash dirt to fall to the floor without striking the transformer coils or core. The slide bearings are set out at the ends well away from the line of the flash and the piston rods and linkage which operate the air clamps are shielded by a flash-proof hood.

Push-up pressure is supplied by a hydraulic cylinder and an oil pump. Dies for the smaller flues are arranged so that two different sizes can be handled by one set of die blocks. The dies are water cooled and are adjustable for vertical alignment by means of hand wheels at the front of the machine and they can be moved on the jaw members for further adjustment.

Accurate heat control is provided through ten points of heat regulation, five obtained through a switch on the machine and five by a simple change of connections on a terminal board. The 150-kva nominal rating is based on a 50-per-cent duty cycle. The primary may be wound for 220-, 440- and 550-volt, 60-cycle current. Arrangements can be made to furnish the machines for the same voltages on 25-cycle current.

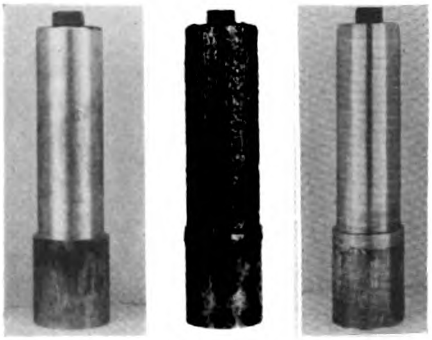
Flue sizes from 1¼ in. to 6 in. in outside dimensions can be accommodated, standard pipe from the same minimum to 4½ in. outside diameter. Extra heavy pipe from the same minimum to 3½ in. maximum, and double-extra-heavy pipe from the same small size to 2½ in.



Flash welder for use in flue shops

Electrodes for Tool Steel Welding

Fractured, or worn hot working steel dies, punches, shear plates, etc., are being successfully rebuilt by the use of tool-steel



Hot work upsetting punch—Left: As prepared for welding—Center: As welded—Right: After finishing, ready for use again

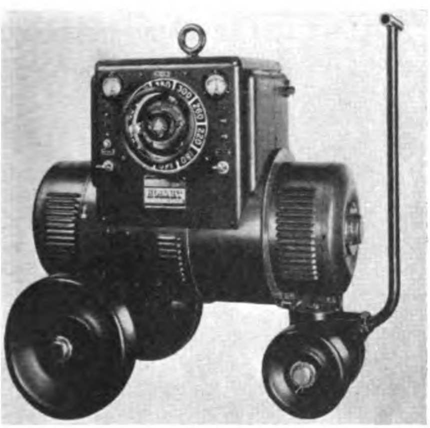
electrodes which give a metal deposit of the same characteristics as typical high-tungsten and chromium hot-working steels.

These electrodes, known as No. 72 Eureka hot-work tool-steel electrodes, contain additional alloying elements to improve further the deposit's air-hardening, hot-working qualities.

Under controlled welding conditions an ultimate Rockwell hardness of 54 to 56 on the C scale can be obtained. The deposit secured with the No. 72 electrode will take the heat treatment typical of hot-working steels. The Welding Equipment & Supply Co., Detroit, Mich., the manufacturer of these electrodes, also furnishes others for other types of tool-steel welding.

Portable 300-Amp. Arc Welder

Offering 1,000 combinations of voltage and welding current, without dead spots, the Hobart portable 300-amp. arc welder includes a number of design features which have recently been developed. The multi-



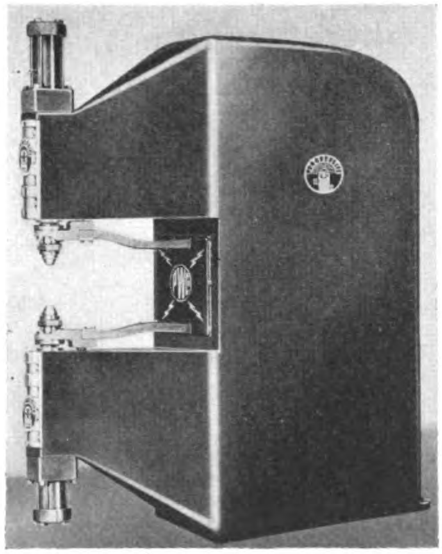
A 300-amp. motor-driven arc welder on which Hobart is concentrating production facilities

range dual control with 10 ranges of welding current and 100 steps of voltage in each range make available the 1,000 steps of open-circuit voltage and welding current for selecting any desired arc characteristics.

A volt-ampere adjuster is compactly built within the main switch and is easily removed if remote operation of the machine is desired. A built-in, four-pole exciter insures prompt building up of voltage and freedom from accidental polarity reversal. Convenient links make possible an easy change-over of motor connections from 220 volts to 440 volts. The Hobart Bros. Co., Troy, Ohio, manufactures and distributes these machines.

Controlled Weld Temperatures

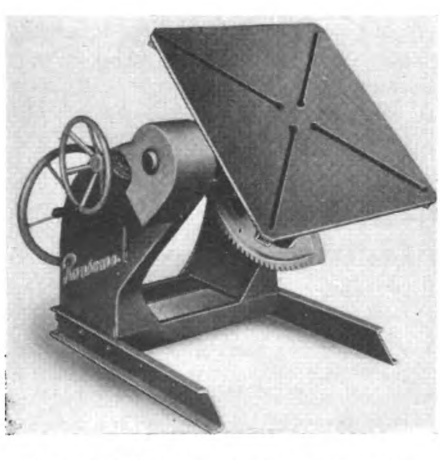
Designed for resistance welding of heavy sections and of special alloy steels, the Temp-A-Trol is said to be completely automatic in controlling weld temperatures. It is self-compensating for variations in metal thickness, induction and short-circuiting losses, presence of scale and other factors which affect ordinary spot-welding operations. With completely automatic control of welding, heat treating and annealing cycles the human element in operation is reduced to selecting by dial regulators the actual temperatures desired. The Progressive Welder Company, Detroit, Mich., manufactures this machine.



Temp-A-Trol self-regulating forge welder

Welding Positioners Increase Production

The primary function of a welding positioner is providing the ideal downhand welding position. Increased production and savings in labor cost are claimed by the Ransome Concrete Machinery Co., Dunellen, N. J., in cases where positioners are used. This company manufactures a full line of manually-operated and motor-operated machines for use in welding shops. The model illustrated is a 2,500-lb. hand-operated unit and the same capacity machine is also available with a motor attachment. Other sizes of 3,000-lb., three and eight tons' capacity are furnished with motors.



Ransome 2,500-lb. capacity, hand-operated welding positioner

The 2,500- and 3,000-lb. units can be revolved 360 deg. in either direction and tilted 135 deg. beyond horizontal. The larger sizes revolve 360 deg. in either direction and the table top tilts through a range of 45 deg. from horizontal in one direction to a vertical position in the other direction. The table spindles on all models turn in two Timken tapered roller bearings. Motor-operated positioners are furnished with individual constant-speed motors for tilting and rotating, although variable-speed motors can be supplied. Limit switches are provided on the tilting operation and motors shut off automatically at the two extreme positions of tilt.

Welding Goggles

An industrial welding goggle which with the heaviest lenses weighs only 3 oz. is offered by the Sellstrom Manufacturing Company, Chicago, for the use of welders. This goggle incorporates a patented method of indirect ventilation which provides a continuous flow of air into the eye cups and practically eliminates lens fogging. The frame of the goggles is made of a moulded plastic noted for exceptional strength and impact resisting qualities. The cups fit snugly and comfortably.

Nineteen Stages of Heat Control

An alternating-current arc welder designed to produce a smooth, uninterrupted welding arc at all heat stages has been introduced by the Marquette Manufacturing Company,

Marquette a.c. arc welder for fast, heavy-duty industrial service

Inc., Minneapolis, Minn. This unit, designated as Model No. 400 BBT, is a 400-amp. a. c. welder, in which extra-capacity, dual transformers furnish a flow of welding power from 19 positive-contact heating stages ranging from 45 amp. to 400 amp. These machines have a built-in automatic voltage control which eliminates the neces-

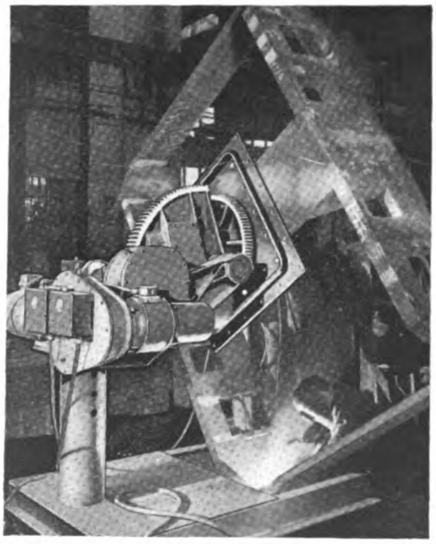
sity of manual adjustment and speeds welding. Variable power take offs are made from multiple outlets in a heavily insulated panel on the side of the machine. Solid tapered jacks and taps furnish a simple positive electrical and mechanical contact at all times and provide a high safety factor. These welders are so insulated that "around the clock" operation is possible. Mounted on a four-wheel iron truck, the machines can be moved from job to job.

Balanced polarity in a 60-cycle alternating current results in a stable, even arc throughout the welding operation and is said to provide freedom from magnetic blow common to d. c. welding currents.

Positioned Welding For Better Work

Manually or motor-operated welding positioners of small capacity and motor-operated units of large size are built by the Cullen-Friestedt Co., Chicago, Ill. The tables on all units tilt from horizontal to 135 deg. with a complete table rotation of 360 deg. available. The table tops can be removed to allow the use of special jigs and fixtures and a table height adjustment can be made to increase the usefulness of the positioner.

By providing a wide range of adjustments these positioners make it possible for welders to operate at all times in the most convenient working position and all welds are made in the downhand position



Positioner being used in welding Diesel locomotive motor frame

which is recognized as the one in which best welds are obtained.

Safety limit switches are provided on motor-operated models which cut off motors automatically when extreme positions of tilt are reached. Variable-speed motors on the rotating action permit the operator to adjust the speed of rotation and remain in one position while making a continuous weld.

Protective Control Device

A device developed by the Lincoln Electric Co., Cleveland, Ohio, is designed to provide complete protection against heat, excessive current, or both, on arc-welding machines. Operation at maximum capacity for long periods without harm to machines is said to be possible when this device is used. It consists of two current transformers, the primaries of which are connected in series with the motor leads with the secondaries supplying power to operate two snap-action thermostats which are mounted directly on the motor lamination.

In the illustration the transformers are shown in the top position and the thermostats at the lower indicated point. The thermostats are connected to the lamination in such a manner that they operate by

Welder equipped with protective control to prevent overheating

means of heat conduction as well as by current passing through them. The thermostats will trip open if the temperature in the room exceeds safe machine operating temperature; if the motor is cold and excessive, possibly damaging, currents occur; if the machine is started on single-phase lines; if the machine is operating and one fuse blows so that the motor is operating single-phase and overheats; if the rotor is locked with normal three-phase power attached; and if the welder is operated for long periods of time at sustained overloads. Thermostats reset automatically when the motor has cooled to a safe operating temperature.

Estimating Electrode Needs

Engineers, supervisors, purchasing agents, operators, and all others who use or supervise the use of arc-welding electrodes can obtain a copy of the new General Electric Welderule and save time in estimating electrode requirements. Operating in a manner similar to a slide rule, the Welderule reads directly the length of arc-welded joints obtainable per 100 lb. of electrode, also the pounds of weld metal deposited per 100 lb. of electrode. The information covers 11 different commonly used sizes and types of joints; also 22 different sizes and types of electrodes in general use in both the 14-in. and 18-in. lengths.

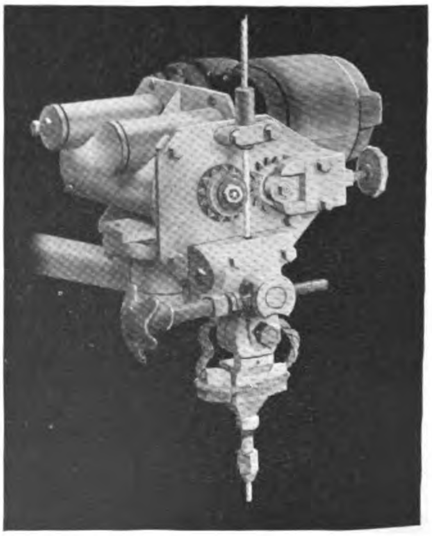
Although general data of a similar nature have been published in bulletin form, the Welderule enables more accurate estimates to be made because it applies to specific types and sizes of electrodes. Being of vest-pocket size, it is easy to handle and convenient to use.

An additional feature is a selector chart which shows the various filler metal classifications as specified by the American Welding Society and the types of electrodes which meet these classifications. The Welderule may be obtained from any local G-E arc welding distributor, G-E sales office, or from General Electric Company, Schenectady, N. Y.

Arc Welding Heads for Automatic Operation

Utilizing two electric motors, one of constant speed and the other of variable speed, inter-connected by differential gearing, the Unamatic arc welding head will maintain a constant arc of correct length on automatic arc welding operations. Arc voltage governs the variable-speed motor and determines the rate at which the electrode is fed to the work.

Sliding brush contacts energize the electrode in these heads and the welding wire is advanced by knurled knobs operated by the two motors. The constant-speed motor remains unaffected by voltage rise or drop in the arc while the variable-speed motor, which has the same r.p.m. at its lowest



Unamatic electric arc welding head

speed as the constant-speed motor, increases or decreases in speed as the arc voltage changes. This is the motor which compensates for any irregularity during welding, either of work or current, through increasing or decreasing its speed and, there-

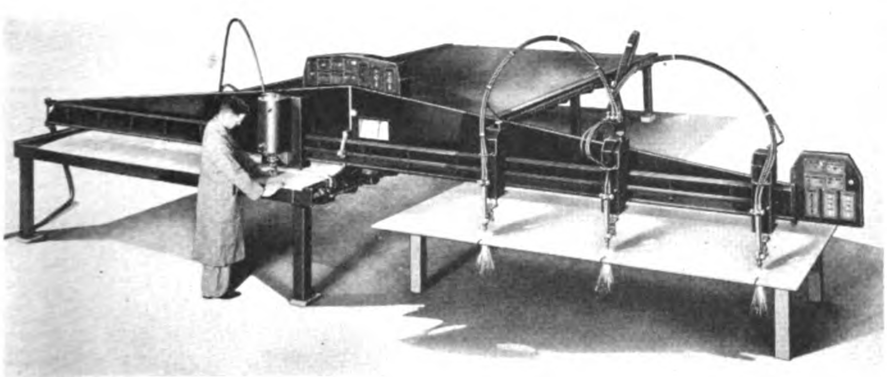
fore, the rate at which the electrode is fed to the work.

This equipment, which is said to be in successful use in several large railroad shops on center-sill welding and the building up of locomotive car wheel centers, is manufactured by Una Welding, Inc., Cleveland, Ohio.

Shape-Cutting Machines

Shape-cutting machines furnished by the National Cylinder Gas Co., Chicago, are designed to meet railroad requirements for cutting out main and side rods, spring equalizers and numerous other car and locomotive parts. By the use of an automatic spacer attachment the pre-heating flame is kept the proper distance from the plate being cut, whether or not there are variations in metal thickness. There is a central operating-control panel on the machine which is supplemented by an auxiliary control at the end of the carriage and from either point full control of operations is possible. The torches on the National Type R machine can be operated independently of each other, permitting the use of one cutting head on a straight cut while the other is following the pattern set on a tracing device.

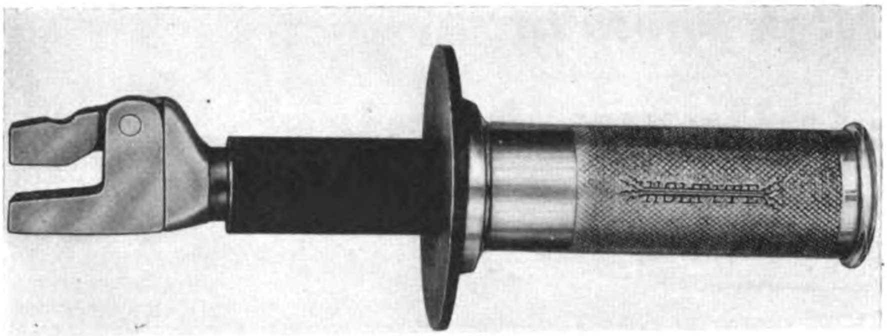
A cutting calculator is placed on the control panel of the machine and it gives the operator a ready-reference guide for tip size, speeds and pressures for any metal thickness. Bevel cuts can be made by checking the angle of each torch on a panel indicator.



National Type R multiple-cutting machine

Electrode Holder with Replaceable Jaws

Developed during actual welding service under all possible conditions from the lightest to the heaviest welding jobs, the Holtite electrode holder is designed to decrease operator fatigue and reduce heat transfer through the handle. Available in 300, 400 and 500 ampere models the holders are designed with replaceable jaws and a renewable insulating tube which separates the handle from the jaws. These features contribute to a longer service life per holder. The vise-like grip of the jaws on the electrode gives a positive electrical contact at all times. The holders are made by the Holtite Holder Co., Herrin, Ill.



Heavy-duty electrode holder with replaceable jaws

Low Priority Hard-Facing Rods

To serve companies unable to furnish high priority ratings, the Stoody Company, an affiliate of the Air Reduction Sales Co., New York, has developed two new hard-facing alloys which are being marketed under the trade names of Stoodite K and Stoody self-hardening K.

Stoodite K is a cast hard-facing rod consisting principally of molybdenum, tungsten, manganese, silicon, carbon, and iron. It is supplied both in bare form for oxy-acetylene application and in coated form for d. c. electric application, and is recommended for hard-facing operations on equipment subjected to abrasive wear.

Stoody self-hardening K is composed principally of molybdenum, manganese, silicon, carbon, vanadium, and iron, and is made in the form of tubes with the mixed alloys on the inside. This rod is also available for oxyacetylene and d. c. electric arc applications.

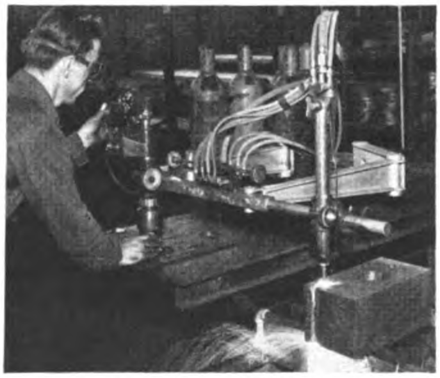
In addition to being highly resistant to wear, Stoody self-hardening K will also withstand considerable impact if properly supported. It forms an excellent bond with manganese steel and can be used for hard-facing various types of manganese equipment. Deposits can be forged providing forging is done at red heat. It is recommended for hard-facing parts subjected both to severe wear and impact.

Both Stoodite K and Stoody self-hardening K are available under the regular A-10, P-100 rating.

High-Speed Tips For Machine Cutting

Designed to fit standard machine-cutting torches, the Airco "45" high-speed cutting tip has been developed by the Air Reduction Sales Co., 60 East 42nd street, New York. Increased cutting speeds of from 20 to 30 per cent are said to be effected, with the cuts being of comparable quality to those obtained with standard tips.

The new tip has a nozzle with a divergent exit portion, a design that makes it possible to eject a narrow, high-velocity stream of oxygen, practically free of exit turbulence. A narrower path or kerf through the metal is said to be obtained when using this tip. High operating pressure is required and the velocity of the oxygen stream is further increased by the divergent tip which provides a higher oxygen concentration at greater depths in the metal being cut. The tips are available in a range of sizes for cutting metal thicknesses up to eight inches.



Airco "45" high-speed machine tip cutting 6-in. alloy steel

High Spots in

Railway Affairs . . .

Passenger Car Section Established

The Association of American Railroads has announced the formation of a Passenger Car Section of the Car Service Division. Edwin F. Bilo is the manager and the section will have its headquarters in the A.A.R. offices in the Transportation Building at Washington, D. C. Obviously the shortage of passenger equipment and facilities under wartime conditions makes it necessary for the railroads to co-operate much more intimately in the handling of passenger traffic than under normal conditions. The principal purpose of the Section will be "to obtain the greatest practical efficiency in the use and handling of passenger train equipment."

Public Aids to Transport

The Board of Investigation and Research, authorized under the Transportation Act of 1940, has announced that it will open public hearings in Washington, D. C., on June 29, in connection with the investigation of public aids to transportation. This will afford opportunity for interested parties "to present basic statistical data and to submit evidence bearing on the principles and methods which may be applied in determining the extent of public aids and in allocating the cost of such aids." The announcement includes a number of specific items relating to highway, railway, waterway, airway and pipe line transportation, although evidence submitted will not be limited to the suggested questions. It is expected that the hearings will be concluded before July 4.

Runs Interference For the Railroads

John W. Barriger, III, associate director of the Office of Defense Transportation, and also federal manager of the Toledo, Peoria & Western, has a colorful personality and is kept everlastingly on the run with his various assignments. In speaking at an economic conference of the National Association of Mutual Savings Banks, he pointed out that railroad service is a highly perishable commodity that cannot be ordered far in advance, or stored until wanted. He also noted that in their preparations to meet the national emergency, the railroads had not been given aid, as have other industries, by a Defense Plant Corporation set up to relieve them from financial liability for new facilities that may not be needed under post-war conditions. In spite of this, the railroads alone, of all the industries affected by war-time demands, have made a hit every time they have gone to bat. In defining the purpose of O.D.T. and its relationship to the railroads, he said that to provide transportation in the rapidly increasing quantities that the war effort will demand, private management needs such an organization as the O.D.T. that understands its necessities and can "run intereference" for it in sweeping obstacles out of the way.

Personnel Problems

We are so accustomed in these days to speak in astronomical terms that sometimes we fail to comprehend the immensity of a task that deals only in terms of thousands or tens of thousands. When we have struggled hard, however, to find a man to replace satisfactorily a single selectee, we are more likely to appreciate the significance of the statement made by Director Otto S. Beyer, Division of Transport Personnel, O. D. T., that we will require 320,000 new railroad hirings for the rest of 1942, dating from May 1. Director Beyer estimates that 117,000 new railroad jobs will be created by wartime expansion and the October car loading peak, 22,000 will be required to replace men inducted into the armed services, 167,000 for turnover, and 14,000 to provide for the vacations which many railway workers were granted by the Emergency Board award of December, 1941. Incidentally, these figures do not include casual jobs of a few days' or a few week's duration.

Grade Crossing Accidents Increase

In the first three months of this year 562 persons were killed and 1,580 injured as the result of grade crossing accidents. This compares with 525 killed and 1,380 injured during the same period last year. Delays to the movement of war materials because of these accidents are not inconsiderable. The Safety Section of the Association of American Railroads finds that the delay to freight trains alone averages about 460 hours per month. In spite of the hazards involved, motorists fail to take proper precautions in approaching and passing over highway-railroad grade crossings. This is emphasized by the fact that 82 per cent of these accidents take place at crossings having special protection, consisting not only of the standard sign that warns motorists they are approaching a grade crossing, but also some special device such as flashing lights, gates or watchmen. In one-third of the accidents motorists actually drove into the sides of trains. Another disturbing fact is that about 80 per cent of these grade crossing accidents involve motorists at crossings in the vicinity of their homes.

Ore Moving Over Great Lakes Fast

When the last ore boat left Duluth early in December, 1941, Ralph Budd, at that time defense transportation commissioner, announced that "the all-time record for ore transportation on the Great Lakes was exceeded by nearly 15 million tons during the past season." In all, more than 80 million gross tons of ore had been handled over the Great Lakes. The 1942 goal is 89,500,000. That a splendid start has been made toward achieving this goal is indicated by the fact that iron ore shipments up to May 1, this year, amounted to 8,581,740 gross tons, an increase of 1,626,947 tons, or 23.9 per cent over the same period in 1941. Under orders of the Office of Defense Transportation, grain traffic over the Great Lakes was on May 15 discontinued in vessels capable of carrying iron ore.

"Trade Barriers" Hamper Traffic

Lieut. Gen. Brehon B. Somervell, chief of the War Department's Services of Supply, was most fittingly chosen as the concluding speaker at a three-day conference of federal and state officials, called by President Roosevelt to consider certain state laws and regulations which have proved to be handicaps in our war efforts. General Somervell declared that, "we have found numerous instances of unreasonably rigid enforcement of state trucking regulations that have delayed highway shipments of vital war materials. Truck drivers have even been sent to jail for technical violations and state and local officers have stubbornly refused to use common sense in the matter of loading laws. We find the same trouble in rail transportation. If we're going to use our rails to the fullest extent to win this war, we're going to have to relax special limitations on train lengths and similar matters."

Ickes Hard to Satisfy

Petroleum Co-ordinator Harold L. Ickes, in an address at Boston, Mass., on May 27, indicated that the railroads and the oil companies had done a superb job in carrying oil to the East Coast by tank car. He went on to say, however, that he wished "the railroads had not fought the pipe lines as vigorously and misfortunately as they did." The latest figures available when this was written were for the week ended May 16. They showed that 684,482 barrels of oil had been handled daily by the railroads in tank cars during that week. The 26 oil companies participating loaded 21,295 cars.

NEWS

WPB Turns Down Eastman Plea for More Equipment

The War Production Board has refused to alter its recent decision allocating materials for production this year of only 18,000 freight cars and 300 locomotives in addition to the 44,150 cars and 926 locomotives contemplated in schedules previously approved by the former Supply Priorities and Allocations Board. While WPB made no announcement of its decision, it was learned that no additional materials will be forthcoming as a result of the recent rehearing on the matter which it gave Director Eastman of the Office of Defense Transportation.

Eastman Sees Carriers Handling 12 to 15 per cent More Traffic This Year

Predicting an increase this year in carloadings of 12 to 15 per cent over those of last year, Joseph B. Eastman, Director of the Office of Defense Transportation, told the Truman defense investigating committee on April 23 that he felt the railroads would be able to handle this increased amount of traffic despite a "tight" situation in some types of equipment. Mr. Eastman had been called before the Senate committee to bring it up-to-date on the question of transportation and its relation to the war effort.

In regard to locomotives, he noted that because of the east coast oil situation due to submarine sinkings and tanker diversions, the carriers are now hauling some 600,000 barrels of oil a day as compared with 70,000 barrels in December. This movement, he continued, is using 850 locomotives, thus causing a tight situation in some localities. He also pointed out that bananas are now moving by rail from New Orleans to New York, thus throwing an added burden on the railroads. In addition, he told the committee that there has been a reduction of 40 to 50 per cent in the coal movement by water to the New England ports, and his office hoped to divert some of the lake cargo coal to rail movement to speed up the hauling of iron ore.

More equipment, better use of existing equipment, and a reduction in the amount of railroad work were listed by the ODT chief as ways of meeting the problem of increased traffic on the railroads. Among the specific suggestions which Mr. Eastman made in discussing the latter was an inventory of the locomotive situation. In this connection he told the committee that other roads had already loaned locomotives to the Southern Pacific and the Boston & Maine.

On the subject of obtaining more new equipment than that already authorized by WPB, Mr. Eastman preferred not to express definite opinions. He felt, however, that the capacity of the locomotive plants should not be decreased and that there will have to be more open-top cars than originally contemplated.

Emergency Board Procedures

Acting upon the recent suggestion of railway labor leaders, President Roosevelt has made public a May 21 executive order setting up for the duration of the war procedures whereby labor-management disputes in the railroad industry may be submitted to emergency fact-finding boards without the necessity for the taking of a strike vote among labor organizations involved. The President, who made the announcement at his May 22 press conference, said that his action comprised a follow-through from the suggestion of the labor leaders, and he added that it had the approval of the Association of American Railroads.

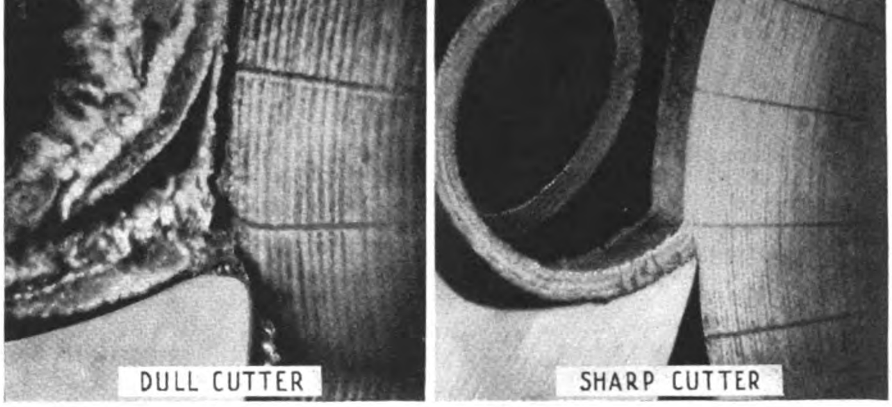
The order creates a panel of nine members, one of whom shall be designated by the President as chairman. From that panel, emergency fact-finding boards would be appointed by the chairman. The plan contemplates that when a wartime dispute reaches the stage where under normal procedures a strike vote would be taken, "the duly designated and authorized representatives of employees involved in such dispute, may, prior to notice by the National Mediation Board to the President of a threatened interruption to commerce, notify the chairman of the panel of the failure of the parties to adjust their disputes and of their desire to avoid the taking of a strike vote and the setting of a strike date." If, in the judgment of the chairman, the dispute is such "that, if unadjusted, even in the absence of a strike vote, it may interfere with the prosecution of the war, he may thereupon select three members of the panel to serve as an emergency board to investigate such dispute and to report thereon to the President."

Thus, only labor can invoke the services of the panel. Also, a dispute could still reach the usual type of emergency board, if there were a threatened strike as a result of dissatisfaction with the recommendations of a board created by the panel. However, as the White House announcement pointed out, the procedure was set up "in view of the fact that American labor generally has agreed that during the war there shall be no strikes." Nevertheless, the executive order specifically protects section 1 of the Railway Labor Act, which contains the emergency board provisions, when it stipulates that the "exclusive and final jurisdiction" conferred on a board appointed from the panel shall be "subject to the provisions of section 10." As the White House announcement put it: "The executive order does not seek to amend the Railway Labor Act which has worked so well for many years. It merely sets up for the duration of the war an extra-statutory panel which will provide a means of adjusting disputes without actual strikes."

Members of the panel were not immediately announced by the President, who said he had not decided on who would be appointed. The chairman is to receive such compensation and expenses as the President may prescribe; while the other members will receive expenses or a per diem allowance for the time they are actually on assignment. Qualifications for membership are the same as those provided in section 10 for membership on emergency boards.

Metal Cutting Film

"Chips" is the title of a new sound film that has been produced for the Warner & Swasey Company as a part of its Turret Lathe Operator's Service Bureau program for the training of operators. The service includes a staff of instructors trained in the technique of grinding and setting up cutting tools which are available to conduct one-hour programs in industrial plants using metal-cutting tools. The program



From the sound film "Chips"

involves the use of model tools, giant model cutters, and charts, in addition to the sound film, and all operators who attend receive a 16-page booklet featuring the high spots of the instruction. The instructors and film are available without charge.

The booklet is an interesting supplement to the sound film in that it provides a permanent reference to the important points which the film dramatizes. It contains sections on the selection and grinding of cutters and illustrated notes on the functions of cutting tools and the manner in which improper grinding of the cutter or the improper setting of the cutter in the tool holder can easily defeat the purpose of the cutting tool—to remove metal. The sound film shows at 1/100th actual cutting speed exactly what happens when a cutter is ground incorrectly. It also includes instruction in the use of chip grooves, control of size and length of chips, function of coolants and the advantages of honing cutters.

Auto-Loading Devices Improperly Secured

WITH the curtailment of automobile production, a number of railroads are using cars equipped with automobile-loading devices in general service. When cars are so used, it is necessary that the racks be properly anchored in the roofs of the cars and fastened in such a manner that there is no danger of their dropping on the lading underneath. These necessary precautions are not being taken in all instances and lading is being damaged, according to C. H. Buford, vice-president, A. A. R., Operations and Maintenance department, who requests that, when the racks have not been permanently fastened to the roofs of the cars, they be engaged in the anchor hooks provided and, in addition, be secured by means of wire or other fastenings so there is no possibility of their shaking loose and falling on the lading underneath. This is particularly important when device cars are used for war equipment or material essential to the war production effort.

Processed Parts May Now Be Shipped to Car Builders

THE War Production Board has now made clear that freight-car producers may accept deliveries of parts and materials from suppliers if they are not subject to other rated orders, despite the fact that all preference ratings of A-2 or lower assigned to freight-car producers were recently cancelled.

Amendment No. 1 to Supplementary General Limitation Order L-97-a-1 clarifies the original order issued April 29, which prohibited producers from accepting delivery of material for car construction on orders rated A-2 or lower which was not in transit to them on that date. The amendment provides that suppliers may dispose of inventories of processed or partly-fabricated parts, if deliveries can be made to producers as on unrated orders.

Under the terms of the amendment, any producer or supplier may sell or deliver to any other producer or supplier or to a railroad any parts manufactured from materials obtained under a preference rating. "This," said the WPB announcement, "will permit balancing of inventories, and will assure maximum utilization of inventories. The original order gave this sale and exchange privilege to producers only."

Orders and Inquiries for New Equipment Placed Since the Closing of the May Issue

LOCOMOTIVE ORDERS

Road	No. of Locos.	Type of Locos	Builder
Boston & Maine	6	5,400-hp. Diesel-elec.	Electro-Motive Corp.
Chicago & Eastern Illinois	1	600-hp. Diesel-elec.	Baldwin Loco. Wks.
Detroit, Toledo & Ironton	4	2-8-2	Lima Locomotive Wks.
Minneapolis, Northfield & Southern	1	660-hp. Diesel-elec.	Baldwin Loco. Wks.
Newburgh & South Shore	2	660-hp. Diesel-elec.	American Loco. Co.
Peoria & Pekin Union	1	1,000-hp. Diesel-elec.	American Loco. Co.
St. Louis-San Francisco	5	1,000-hp. Diesel-elec.	Baldwin Loco. Wks.
Western Maryland	3	660-hp. Diesel-elec.	Baldwin Loco. Wks.

LOCOMOTIVE INQUIRIES

Road	No. of Locos.	Type of Locos	Builder
Lehigh & Hudson River[1]	3	4-8-2	....
Western Pacific	6	2-8-2	....

FREIGHT-CAR ORDERS

Road	No. of Cars	Type of Cars	Builder
Bessemer & Lake Erie	800[1]	90-ton hopper	Pull.-Std. Car Mfg. Co.
Phelps Dodge Corp.	190[1]	90-ton ore	Western-Austin Co.
Republic Steel Co.	10	50-ton hopper	American Car & Fdry. Co.

[1] Unconfirmed.

Order Facilitates Exchange of Car Materials Inventories

"IN order to make full use of existing inventories in the hands of all freight-car makers before permitting them to receive additional raw materials," the War Production Board has issued an order canceling all preference rating of A-2 or lower on material for car construction which has not already been received by, or placed in transit to, the producers.

At the same time, the order, Supplementary General Limitation Order No. L-97-a-1, effective April 29, permits any producer to sell and deliver any material which he has on hand or in transit to any other producer of freight cars. "This will permit balancing of inventories between producers by sale or exchange, and will assure maximum utilization of all supplies now on hand," said WPB announcement.

It was explained that the supplementary order was issued because some producers now have larger inventories of certain types of material than they will be allowed to use under this year's freight-car building program as authorized by the Requirements Committee of WPB. The WPB has approved the construction of only 18,000 freight cars this year, over and above the 45,000 cars contemplated in the previous authorization by the former Supply Priorities and Allocation Board program announced last fall.

The number of cars to be built by each producer is being scheduled by the Transportation Branch of the WPB, and the order will allow producers to transfer to other manufacturers materials in their inventories which are in excess of the amount required for the number of cars they will be permitted to build.

Amendment No. 1 to General Limitation Order No. L-97, also announced, excludes mining locomotives from the provisions of that order. This action was taken because priorities for mining locomotives are controlled under the terms of the Mining Machinery Order, P-56. The manufacture and distribution of such locomotives are controlled by the preference rating orders administered by the WPB Mining Branch.

Railroad Shops to Produce War Materials

FULL use of railway-shop facilities, wherever available, to help in the production of war materials, was unanimously agreed to by railroad management and the railroad shop crafts at a recent meeting with representatives of the War Production Board, the Department of Labor, and the Office of Defense Transportation. Announcement of the agreement was made on May 13 by Director Eastman of ODT who presided at the conference.

In agreeing to WPB's request for use of the railroad shops, the representatives of the shop-craft unions "expressed the desire that first consideration be given to the utilization of all available shop facilities for the manufacture of railway equipment such as new cars and locomotives." Meanwhile, Mr. Eastman said, the shops may be asked to consider the production of items used in military and naval equipment, in marine transportation, and in the manufacture of munitions and other war materials.

The ODT director commended the employees' unanimous agreement to work on war materials at railroad basic shop pay, and on the rail shop's 48-hour-week schedule. He pointed out that labor employed on government contracts in other industries works under the provisions of the Walsh-Healey Act on a 40-hour-week basis, and "in many cases at higher hourly wage rates." The Department of Labor, at the request of the War and Navy Departments, has agreed to exempt the railroad industry from the provisions of the Walsh-Healey Act. Mr. Eastman also commended railroad management, calling its willingness to cooperate "another demonstration of the manner in which the railroads are facing the war emergency."

A committee headed by Otto S. Beyer, director of ODT's Division of Transport Personnel, and composed of two other members representing the government, three from the railroad unions, and three from railway management, will be set up to exercise general supervision of the plan.

(Continued on next left-hand page)

Use of the shops, under the agreement with WPB, will probably be arranged through contractors and subcontractors, Mr. Eastman indicated. It is estimated that 75 major shops and more than 400 back shops, employing 150,000 men, will be affected.

Carriers to Train Military Railroaders

MAJOR railroads of the United States are cooperating in the establishment of the Military Railway Service, Corps of Engineers, according to a recent War Department announcement.

Initially, the Southern, the Atchison, Topeka & Santa Fe and the Pennsylvania each will train an engineer battalion (railway operating), while the New York Central will train an engineer battalion (railway shop), the announcement said. Each battalion is in command of a lieutenant colonel.

Headquarters for the Military Railway Service are at Fort Snelling, Minn. Colonel Carl R. Gray, Jr., Engineer Reserves, formerly executive vice-president of the Chicago, St. Paul, Minneapolis & Omaha, has been called to active duty and will be in charge of the service. He will have direct charge of training all men for the Military Railway Service.

In an address before the Freight Claim Division, A. A. R., on April 29, Colonel Gray said that the headquarters organization will include an Operating Department, in charge of a general superintendent of operation—N. A. Ryan, who was general manager, Western Lines, Chicago, Milwaukee, St. Paul & Pacific, and who now has the military rank of colonel; an Engineering Department, in charge of an engineer maintenance of way—B. H. Crosland, who was division engineer, St. Louis-San Francisco, and who now has the military rank of lieutenant colonel, and Mechanical and Stores Departments. The organizations of the latter are as follows:

Title in Service, Military Rank, Name, and Previous Title on Railroad

MECHANICAL DEPARTMENT

Chief mechanical officer, Colonel W. G. Knight, (Mech. supt. B. & A., Derby Me.)

General superintendent motive power, Colonel J. K. Tully, (Asst. to v.-p. eng. research Pullman Co., Chicago, Ill.).

Superintendent car dept., Major F. E. Cheshire, (Asst. supt. car dept. M. P., St. Louis, Mo.).

Assistant master car builder, Captain H. L. Thomas, Jr., (Mech. eng. Penna., Philadelphia).

Assistant car department, 1st Lieutenant G. E. Hargraves, (Mech. eng's off. Penna., Philadelphia).

STORES DEPARTMENT

General storekeeper, Lieutenant Colonel E. F. McFadden, (Gen. st. keep. U. P., Pocatello, Idaho).

Fuel agent, Captain F. T. Richards, (Spec. purch. agt., P. R. R.).

In addition to the four battalions to be trained by the railroads, the Corps of Engineers is training a battalion in Louisiana. The 711th Engineer Battalion (railway operating), originally was formed at Fort Belvoir early last year. Later in the year the battalion was sent to Louisiana where the Government bought and built a short railroad, now known as the Camp Claiborne-Camp Polk.

Each operating battalion is made up of headquarters and service company and three additional companies whose combined operations are the same as the operation and maintenance of a railroad division, it was pointed out.

The shop battalion also consists of a headquarters company and three additional companies performing equivalent functions to the "back shop" of the railroad, handling the heavy repairs on locomotives and cars. This battalion is in charge of Lt. Col. E. T. Leake who was formerly at the Beech Grove shops of the Cleveland, Cincinnati, Chicago & St. Louis.

This program is expected to furnish a number of Engineer Battalions composed of men who know every phase of railway operation and are able to perform it under actual war conditions, the announcement concluded.

A. J. Kruger Resumes Direction of C. D. O. A.

DURING the absence on military service of F. E. Cheshire, president of the Car Department Officers' Association, the duties of the president's office will be assumed by A. J. Kruger, superintendent car department, New York, Chicago & St. Louis, who is a past president of the association and at present chairman of the General Committee. This action is in accordance with provisions of the constitution and will be effective until the return of Mr. Cheshire or until an annual meeting is held. Mr. Cheshire has been appointed superintendent car department, Military Railway Service, and holds the commission of Major, U. S. A.

Coupler Reclamation

ACCORDING to a circular letter recently sent to members of the Association of American Railroads, Mechanical Division, by Secretary A. C. Browning, tests of welded couplers and cast-steel coupler yokes are being conducted by the Committee on Couplers and Draft Gears in co-operation with the Subcommittee on Welding of the Committee on Car Construction and the coupler manufacturers to determine to what further extent these parts may be reclaimed by means of welding. Preliminary tests apparently show that, in the interests of conserving critical materials, the present 40 per cent minimum for welding cracks and fractures may be safely extended, and a final report and recommendations will be sent to the members just as soon as the tests are completed. In the meantime, in view of the possibility of reclaiming many couplers which are now being scrapped, it is suggested that the member lines hold their failed couplers for possible future reclamation.

New Tank Car Record Set by Carriers

THE tank-car movement of oil into the east coast area soared to a new all-time high with an average of 684,482 barrels a day for the week May 16, according to an announcement of Petroleum Coordinator Harold L. Ickes. This was an increase of 13.4 per cent over the preceding week, when the movement averaged 652,082 barrels a day. Oil shipments from California to Oregon and Washington also reached a new record level of 29,636 barrels daily. The previous high was 29,429 barrels attained during the week ended May 2.

In handling the week's movement into the east, the 21 oil companies participating loaded 19,926 cars. Including cars that were on the way back west for reloading, it is estimated that the east coast service was employing about 48,650 cars, taken largely from other sections of the country.

Priorities

THE following are references to orders of interest to railroads issued by the War Production Board since April 18:

Air conditioning—Limitation Order L-38, issued May 15, places rigid restrictions on the production and sale of air conditioning and commercial refrigeration equipment. For 90 days, only the Army, Navy and Maritime Commission will be entitled to contract for the production of low temperature mechanical refrigerators designed to store frozen food or individual room coolers. After that time, production of these items must be stopped completely. The order prohibits the installation, effective immediately, of any new equipment except on preferred orders and these orders apply only to the Maritime Commission, certain other government agencies, Lend-Lease requirements and persons possessing a preference rating of A-9 or higher issued directly to them and designating the type of equipment desired.

Alloy iron and steel—Amendment No. 3 to Supplementary Order M-21-a, issued May 11, provides that no alloy iron or steel may, after June 1, be melted or delivered to fill orders with ratings lower than A-1-k, except for certain National Emergency and other low alloy steels which may be produced for orders down to A-3 ratings. Purchasers, after June 1, must accompany each order with a statement giving the end use to which the materials ordered will be put, the date on which delivery is needed and a statement that the delivery date is not earlier than necessary for the purchaser to meet his own delivery or production schedules. Meltings and deliveries must be made in accordance with schedules approved by the Director of Industry Operations.

Brass and wire—An amendment to Order M-9-a, issued May 7, limits shipments of brass mill, wire mill and foundry products to ratings of A-1-k or higher, unless specific authorization is given for a lower rated shipment. Deliveries previously were permitted down to A-10 ratings.

Copper products—A revision of Order M-9-c prohibits the use of copper and its alloys, including brass and bronze, in an additional hundred-odd civilian products after June 15 and orders other restrictions. Materials for railroads banned by the order include air conditioning equipment, except for essential repairs and parts necessary for conducting electricity; bands on pipe covering; decorative, general, and finish hardware, and ornamental metal work; door knockers, checks, pulls and stops; doors and windows, door and window frames and window sills; drinking water reservoirs; lighting fixtures, except for parts necessary for conducting electricity; pipe, tube, tubing, and fittings for plumbing and heating, except for essential repairs; shower rods, heads and pans; sinks and drainboards; screens and screenings; towel and luggage racks; water containers for humidification; weather stripping and insulation.

Fuel oil—Order M-144, issued May 5, discontinues preference rating to purchases of fuel oil. The action was taken to prevent companies entitled to the use of a preference rating under a blanket rating order from laying in large stocks of fuel oil while other companies and individuals were unable to obtain necessary supplies.

Machine tools—Order E-1-b, effective May 2, places all new critical machine tools under a limited allocation system by WPB. The order apportions each producer's monthly deliveries of each size of each type of tool, 75 per cent to service purchasers and 25 per cent to other purchasers, the 25 per cent for other purchasers to be divided among foreign purchasers and essential industries in this country and Canada and to be scheduled for delivery in accordance with preference ratings. Any producer who has received rated purchase orders for foreign and other purchasers exceeding 25 per cent of his production of any size of any type of tool for any month, is required to report such orders for analysis and further directions with respect to deliveries. The order, as amended May 15, requires purchasers to include in their orders to manufacturers specifications or other description in sufficient detail to enable the producer to place the tools in his production schedule.

Rubber treads—Limitation Order L-111, effective May 7, prohibits deliveries of rubber-tired hand trucks, of rubber tires for replacement purposes, without special authority, and of all other

(Continued on next left-hand page)

uses of rubber in the manufacture or assembly of the trucks. These trucks are used principally to transport small quantities of materials in and around factories, railroad stations, warehouses, docks, etc. Exceptions are granted where the use of rubber tires is necessary to prevent explosion hazards and to avoid accidents in the handling of explosives or damage to delicate instruments which are an integral part of the truck. Application for authority may be made by filing form PD-468.

Safety supplies—Order L-114, effective May 5, imposes strict regulations on the use of aluminum, copper, plastics and several other commodities in the manufacture of safety equipment. The order prohibits the use of scarce materials in the items listed except for A-2 or higher-rated orders, if the equipment was manufactured prior to the date of the order or from parts ready for assembly on the date of the order. The materials are aluminum, asbestos cloth, chromium, copper, copper base alloys, nickel, corrosion-resisting steel, alloy steel, tin, synthetic plastics, magnesium, rubber, synthetic rubber and neoprene.

Iron and steel—Order M-21, as amended on April 22, restricts deliveries of iron and steel products to preference ratings of A-10 or higher after May 15. The order previously applied to steel products only and the inclusion of iron means that the 2,700 iron foundries in the country must comply with its provisions. Warehouses may deliver carbon steel on unrated orders when the purchaser specifies that the material is to be used for repair and maintenance, but each warehouse is limited, by quarters, to three per cent of its quota for any product for such deliveries. Persons other than producers may deliver on unrated orders nails and small black or galvanized welded pipe.

Nickel scrap—Order M-6-c requires the segregation of scrap containing more than one-half of one per cent nickel by weight and permits its melting only for authorized uses. Nickel scrap must not only be kept separate from other scrap, but various grades and degrees of content of nickel scrap must be segregated by all persons who handle it. Purchase orders for nickel scrap or secondary nickel must bear a certification that the purchaser is authorized to receive nickel and that the material will be used only as permitted by the order. Reports are required by the 15th of each month from persons who produce or have on hand scrap containing more than 500 lb. of nickel content per month, and those who have on hand at the end of a month more than 30 days accumulation of scrap if the nickel content is more than 100 lb.

Priority rules—Effective April 23, all applications for priority assistance, which do not specify a required delivery date, will be returned as prescribed by Priorities Regulation No. 1 as amended, requiring every applicant to specify the latest date on which the items can be delivered to meet obligations or production schedules.

Steel survey—A complete survey of the use of metal in the United States during the first quarter of 1942, and of anticipated requirements for the quarter beginning July 1, was begun on April 20 with the mailing of form PD-275 to all users of metal in raw or semi-fabricated form. The questionnaire is a refinement of the questionnaire sent to 11,000 manufacturers on January 30. The new survey also covers mines, railroads, ship yards, utilities, construction jobs and the petroleum industry, as well as military and naval contractors. To avoid duplication, only the uses and requirements of metal in raw and semi-fabricated form will be reported.

Freight car materials—Supplementary General Limitation Order L-97-a-1, effective April 30, permits producers of freight cars to deliver any material on hand to other producers of freight cars. The number of cars to be built by each producer is being scheduled by the Transportation Branch of WPB, and the order will allow producers to transfer to other manufacturers materials in their inventories which are in excess of the amount required for the number of cars they will be permitted to build. At the same time the order cancels all preference ratings of A-2 or lower on undelivered material for car construction.

Amendment No. 1 to Supplementary General Limitation Order L-97-a-1, permits freight car producers to accept deliveries of parts and materials from suppliers if they are not subject to other rated orders, despite the fact that all preference ratings of A-2 or lower assigned to freight car producers were cancelled April 29. The amendment permits suppliers to dispose of inventories of processed or partly-fabricated parts, if deliveries can be made to producers as on unrated orders. This will permit balancing of inventories and assure maximum utilization of inventories. The original order gave this sale and exchange privilege to producers only.

Supply Trade Notes

W. R. Kuhn has been appointed district manager, Cleveland, Ohio, office of the Allegheny Ludlum Steel Corporation. Prior to his new appointment, Mr. Kuhn was assistant district manager at Cleveland.

◆

Frank U. Hayes has been appointed assistant sales manager of the Bullard Company at Bridgeport, Conn. Mr. Hayes, who becomes assistant to E. Payson Blanchard, sales manager, joined the Bullard Company in 1935 and was appointed sales representative in the middle Atlantic territory in September, 1936. In 1941, he became a technical advisor in the tool section of the production division of the OPM and, upon his return to the Bullard Company, established the firm's sub-contracting division.

◆

The Cincinnati Milling Machine Company and the Cincinnati Grinders, Inc., are now serving their customers in New York state and New England through their sales subsidiary, the Cincinnati Milling & Grinding Machines, Inc., with district offices located in New York, Hartford, Conn., Boston, Mass., and Buffalo and Syracuse, N. Y. Henry Prentiss & Co., who have acted as the companies' exclusive dealer in New York state and New England since 1887, have retired from active business.

◆

Lester E. Godsell, mechanical engineer, has joined the sales force of the Miller-Lewis Railroad Equipment Corporation.

◆

N. H. Brodell has been appointed metallurgical sales engineer of the Copperweld Steel Company, Glassport, Pa. Mr. Brodell was previously with the Timken Roller Bearing Company Steel and Tube Division; the Pittsburgh Crucible Steel Corporation, and the United Alloy Corporation.

Republic Steel Corporation.—*R. W. Helms*, assistant general sales manager of the Berger Manufacturing division of Republic Steel Corporation, has been promoted to the position of general manager of sales, succeeding the late J. W. Strong. *L. S. Hamaker* has been appointed assistant general manager of sales of the Republic Steel Corporation, with headquarters at Cleveland, Ohio.

Mr. Helms entered the service of Berger in 1921 as a cost clerk with the Dallas, Tex., branch, and subsequently served as department manager and branch manager. In 1929, he was transferred to Canton, Ohio, where he joined the general sales

L. S. Hamaker

staff, and in 1935 was promoted to assistant general sales manager.

Mr. Hamaker was formerly general manager of the Berger Manufacturing division of Republic Steel at Canton, Ohio. His first contact with the steel industry was as the operator of a billet pusher on a bar mill heating furnace in one of the Canton mills now part of Republic Steel. During World War I, he served in the United States Marine Corps, returning to Canton in May, 1919, to join the sales department of the Berger Manufacturing Company, later transferring to that company's advertising department. In 1925, he became advertising manager of the United Alloy Steel Corporation of Canton, with which the Berger Company had been merged shortly before. When United Alloy was subsequently merged with the Central Alloy Steel Corporation of Massillon, Ohio, he became advertising manager of the latter company in 1930. The Republic Steel Corporation acquired Central Alloy Steel and in 1931 Mr. Hamaker was transferred to Youngstown, Ohio, as sales promotion and advertising manager. When the Berger organization was set up as a division of the Republic Steel Corporation in 1934, he was made general manager and continued as such until his new appointment.

◆

The Westinghouse Electric & Manufacturing Co.—The following have been elected vice-presidents of the Westinghouse Electric & Manufacturing Co.: *Andrew H. Phelps*, Pittsburgh, Pa., manager of purchases and traffic; *L. E. Osborne*, Philadelphia, Pa., manager of the steam division; *Frank C. Reed*, Jersey City, N. J., president of the Westinghouse Electric Elevator Company, a subsidiary; and *Walter C. Evans*, Baltimore, Md.

◆

Victor E. Rennix, until recently associated with the Chicago office of the Baldwin Locomotive Works, is now serving in the motive power section of the transportation equipment branch of the War Production Board at Washington, D. C. When his service there is ended, Mr. Rennix is expected to resume his former duties with the Baldwin Locomotive Works.

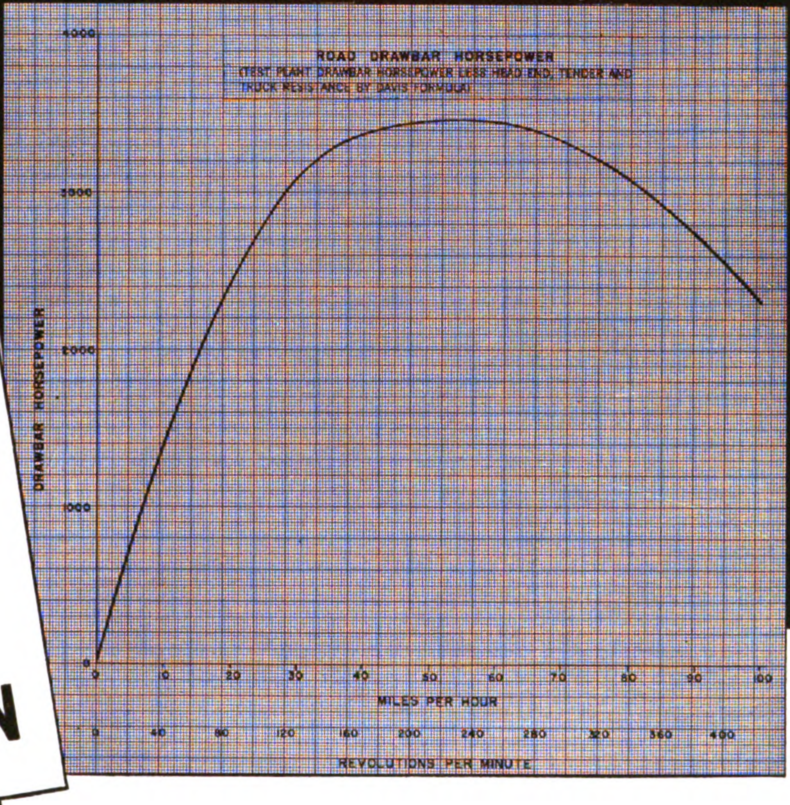
(*Turn to next left-hand page*)

HIGHER SUSTAINED DRAWBAR HORSEPOWER

for Acceleration and Operating Speeds

through the Application of...

THE FRANKLIN SYSTEM OF STEAM DISTRIBUTION



The Franklin System of Steam Distribution, by providing the following features, secures results such as are indicated in the above curve.

1. Separation of valve events, so that admission, cut-off, release and compression are independently controlled.
2. Absolutely fixed valve events at all speeds and all cut-offs.
3. Large inlet and exhaust passages and improved steam flow.
4. Reduced cylinder clearance volume.
5. Reduced weight of moving masses and reduced mechanical friction.

The Franklin System of Steam Distribution is offered to the railroads to meet the increasing demand for a more complete utilization of the potential power in every pound of steam.

FRANKLIN RAILWAY SUPPLY COMPANY, INC. NEW YORK CHICAGO

In Canada: FRANKLIN RAILWAY SUPPLY COMPANY, LIMITED, MONTREAL

PEERLESS EQUIPMENT COMPANY.—*D. S. Hoffman*, assistant vice-president of the Peerless Equipment Company, Chicago, and *Thomas R. Wagner*, formerly assistant district manager of the Sinclair Refining Company, have been elected vice-presidents of the Peerless Equipment Co.

D. S. Hoffman was born in Chicago on October 3, 1904, and graduated from Dartmouth College in 1926. He entered the employ of the Canton Forge & Axle Co., Canton, Ohio, in August of that year and

D. S. Hoffman

in April, 1928, resigned to become associated with the Maintenance Equipment Company, Chicago. In 1930 he joined the P. & M. Company, working out of the San Francisco, Calif., office and in August, 1936, was appointed assistant vice-president of the Peerless Equipment Company at Chicago.

Thomas R. Wagner was born in Philadelphia, Pa., on November 17, 1897, and graduated from Cornell University, Ithaca, N. Y., in 1918. He served in the Marine Corps in World War I and later was employed by

Thomas R. Wagner

the Automobile Blue Book Publishing Company, the Cornell Wood Products Company and the Sun Oil Company. In 1921 he became associated with the Sinclair Refining Company and served as salesman, western manager of the railway sales department and assistant district manager. He resigned from this company to become vice-president of Peerless.

THE MILLER-LEWIS RAILROAD EQUIPMENT CORP. has been appointed representative of the Grip Nut Company, with offices at 80-82 Reade street, New York.

◆

AMERICAN BRAKE SHOE & FOUNDRY COMPANY.—*F. H. Janke*, treasurer of the American Brake Shoe & Foundry Co., has been elected assistant to the president. *Kempton Dunn* succeeds Mr. Janke as treasurer of the company.

◆

FRANK G. LUTH, mechanical superintendent of the Fruit Growers Express Company, has been appointed mechanical superintendent of Iron & Steel Products, Inc., Chicago.

◆

HUNT-SPILLER MANUFACTURING CORPORATION.—*E. J. Fuller*, executive vice-president of the Hunt-Spiller Manufacturing Corporation, Boston, Mass., has been elected general manager. *Victor W. Ellet*, president, will devote more time to corporate matters of the corporation, in addition to his presidential duties. *A. B. Root, Jr.*, has been appointed vice-president; *Frank W. Lampton*, sales manager, and *Joseph Goostray*, assistant general manager.

E. J. Fuller was born in Clinton, Iowa, in 1883. He entered the service of the

Elbert J. Fuller

Chicago & North Western at an early age as a machinist apprentice at Clinton. On completing his apprenticeship, he continued at Clinton as machinist and later was appointed to a supervisory position in the mechanical department. From 1911 to 1913 he was chief inspector of new equipment for the C. & N. W. at the Schenectady, N. Y., plant of the American Locomotive Company. He entered the employ of the Hunt-Spiller Manufacturing Corporation in 1914 and served as mechanical representative until his appointment as assistant sales manager in 1927. He became sales manager in 1928 and was elected executive vice-president in 1936. He now holds the latter position in addition to his duties as general manager.

A. B. Root, Jr., was born in Boston, Mass., in 1886 and was graduated from Tufts College in 1909 with a degree in Civil Engineering. During his early career he was employed in the maintenance of way department of the Boston & Albany and with the Stone & Webster Engineering Corporation as resident engineer on power projects in Montana, Nev., and Georgia. He joined the Hunt-Spiller Manufacturing Corporation as mechanical engineer in November, 1912, and subsequently became assistant to the vice-presi-

Albert B. Root, Jr.

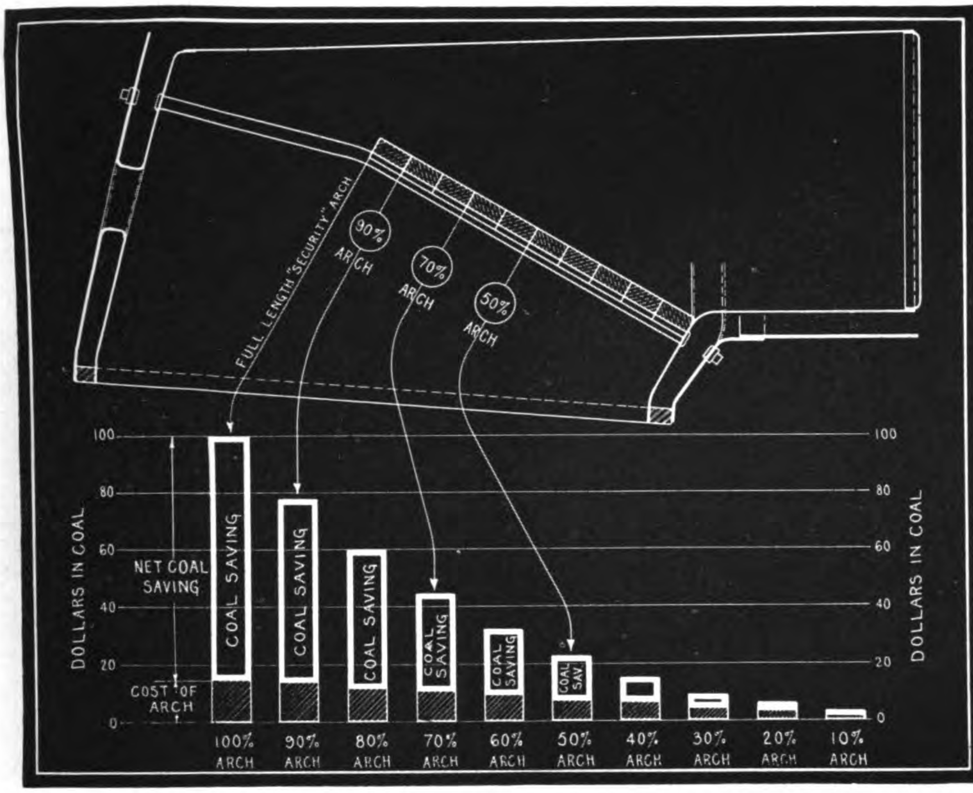
dent, assistant to the president, and assistant general manager, and now vice-president.

Frank W. Lampton was born in Fort Scott, Kan., in 1889 and was graduated from a business course at Windsor Business College there. He was employed as

Frank W. Lampton

a machinist apprentice with the St. Louis-San Francisco at Fort Scott from 1907 to 1912, and as machinist from 1912 to 1915. From 1915 to 1917 he served as master mechanic with the Arcadia Coal & Mining Co., Arcadia, Kan., and from 1917 to 1926 was again associated with the St. Louis-San Francisco as night enginehouse foreman at Pittsburg, Kan.; general foreman, Wichita, Kan.; general foreman, Thayer, Mo., and general foreman, south shops, Springfield, Mo. Mr. Lampton joined the Hunt-Spiller Manufacturing Corporation in 1926 as representative in the southwest territory and was appointed to the position of assistant sales manager in 1941, which he held until he became sales manager in March of this year.

(*Continued on next left-hand page*)



THE EFFECT OF ABBREVIATED ARCHES ON FUEL SAVING

LET THE ARCH HELP YOU SAVE

With the emphasis being placed on saving every railroad dollar, the locomotive Arch becomes increasingly important.

Regardless of the amount of traffic handled, the locomotive Arch saves enough fuel to pay for itself ten times over.

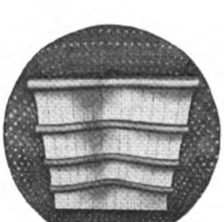
Be sure that every locomotive leaving the roundhouse has its Arch complete with not a single brick nor a single course missing.

In this way, you will get more work for each dollar of fuel expense. Skimping on Arch Brick results in a net loss to the railroad.

THERE'S MORE TO SECURITY ARCHES THAN JUST BRICK

HARBISON-WALKER REFRACTORIES CO.

Refractory Specialists



AMERICAN ARCH CO.
INCORPORATED
60 EAST 42nd STREET, NEW YORK, N. Y.

Locomotive Combustion Specialists

Joseph Goostray was born in Boston, Mass., in 1890, and received his mechanical engineering training at Northeastern University.

Joseph Goostray

He joined the Hunt-Spiller Manufacturing Corporation in the pattern department in August, 1914. During the first world war he enlisted in the United States Navy and served as chief draftsman in the engineering and repair office at the U. S. submarine base at New London, Conn., returning to the employ of Hunt-Spiller when the war ended. He was subsequently promoted to the positions of assistant mechanical engineer, mechanical engineer, and finally mechanical superintendent in charge of maintenance and operation of mechanical and electrical equipment, and of all the departments in which finished machine products are manufactured by the corporation. He held the latter position until his appointment as assistant general manager.

◆

W. G. Merowit has been appointed a representative of the Mahr Manufacturing Company in Western New York State.

◆

E. Kuehn, factory manager of the Electro-Motive Division of General Motors Corporation, has been appointed special representative in railroad transportation.

◆

Carboloy Company, Inc.—*W. D. Bronson* has been appointed district manager, in the Chicago area, of the Carboloy Company, Inc., Detroit, Mich. *Einar Almdale*, of the general office sales engineering department, has been transferred to the Chicago district as a tool service engineer.

John F. Ryan, vice-president of the Railway Truck Corporation, Chicago, has been appointed sales representative of the railroad division of the Socony-Vacuum Oil Company, Inc., with headquarters at Chicago.

Obituary

C. D. Carey, manager of railway sales of the Gulf Companies, died April 14. He was 56 years of age.

◆

Edward Hanson, assistant to the mechanical superintendent of the Pullman Company, with headquarters at Chicago, died suddenly of a heart attack at Milwaukee, Wis., on May 14.

◆

Thomas G. Windes, service engineer of the National Aluminate Corporation, Chicago, died in Evanston, Ill., on May 19 of a heart ailment. He had been in the service of the company 18 years.

◆

Morris S. Towson, president and general manager of the Elwell-Parker Electric Company of Cleveland, Ohio, died in Orlando, Fla., on March 17. He was 76 years of age.

Personal Mention

General

Ivan R. Pease, whose promotion to assistant superintendent motive power of the New York, Ontario & Western at Middletown, N. Y., was noted in the May issue, was born on July 7, 1898, at Wilton, Me. Mr. Pease attended the University of Maine and entered railway service on July 1, 1924, with the New York, New Haven & Hartford as a special apprentice. He subsequently served in the New Haven locomotive shops as gas engine mechanic, foreman of the gas rail car department and production assistant. From 1931 to 1934 Mr. Pease was with the New England Transportation Company (subsidiary of the New Haven) and from 1934 to 1937 was with the Universal Motor Mileage Corporation at Boston, Mass. In 1937 he became test supervisor of the New Haven and in 1941 supervisor of apprentices. He was appointed assistant to superintendent motive power of the New York, Ontario & Western later that year, which position he held until his recent promotion. Mr. Pease will also serve as assistant superintendent motive power of the New York, Susquehanna & Western.

Ivan R. Pease

L. E. Grant, metallurgical and welding engineer of the Chicago, Milwaukee, St. Paul & Pacific at Milwaukee, Wis., has been appointed engineer of tests.

A. G. Hoppe, assistant mechanical engineer of the Chicago, Milwaukee, St. Paul & Pacific at Milwaukee, Wis., has been appointed assistant to the mechanical assistant to the chief operating officer, with headquarters at Milwaukee. This is a change of title.

C. F. Deno, district master mechanic of the Manitoba district of the Canadian Pacific, with headquarters at Winnipeg, Man., has been appointed to the newly created position of chief of motive power for Western Canada.

N. R. Crump, assistant superintendent of motive power of the Canadian Pacific at Winnipeg, Man., has been appointed assistant to the vice-president at Montreal, Que. Mr. Crump was born at Revelstoke, B. C., on July 30, 1904, and attended the public schools of Revelstoke and Vancouver, receiving his B.Sc. and M. E. degrees from Purdue University, Lafayette, Ind., in 1929. Mr. Crump entered railroad service with the Canadian Pacific in 1920 as a machinist apprentice at Field, B. C., transferring to the Weston shops at Winnipeg two years later. He then attended Purdue University from 1925 to 1929, returning to Winnipeg as machinist. In 1930 Mr. Crump became night foreman at Sutherland, Sask., subsequently becoming shop foreman at Lethbridge, Alta., and Calgary, successively. He then served as locomotive foreman at Wilkie, Sask., night foreman at Moose Jaw, Sask., and division master mechanic there, being transferred to Regina, Sask., in 1936. In 1939 he was appointed chief mechanical draftsman for Western lines at Winnipeg and in 1940 he became assistant superintendent of motive power for Western Canada, which position he held until his recent promotion.

N. R. Crump

L. B. George, division master mechanic on the Canadian Pacific at Lethbridge, Alta., who has been appointed works manager of the Weston shops at Winnipeg, Man., as noted in the May issue, was born on April 14, 1896, at Ashton-in-Makerfield, England. Mr. George entered railway service on December 5, 1910, with the Canadian Pacific and was employed as a messenger, clerk and machinist apprentice in the mechanical department at Vancouver, B. C., until September, 1914, when he enlisted with the Canadian Expeditionary Force. In July, 1919, he returned to the Canadian Pacific and completed his apprenticeship. He then served as a machinist and relief locomotive foreman at Vancouver and in August, 1929, became shop foreman at West Calgary, Alta. Mr. George was transferred to Alyth, Alta., in March, 1930, and in July, 1932, became assistant machine shop foreman at the Weston shops. In September, 1934, he was promoted to the position of shop engineer at the Weston shops and in October, 1934, to machine shop foreman. He was general locomotive foreman at Vancouver from July, 1936, until May, 1940, when he was loaned to the Canadian Associated Aircraft Company to study aircraft manufacture in England. In September, 1940, he was appointed division master mechanic of the Canadian Pacific

L. B. George

at Lethbridge, Alta., and in July, 1941, was loaned to the Canadian federal government as assistant supervisor of Aircraft Production, Department of Munitions & Supply, at Ottawa, Ont. Mr. George was appointed to the position of supervisor of Aircraft Production for Canada in September, 1941, in which position he was active until his appointment as works manager of the Weston shops.

Harry G. Miller, engineer of tests of the Chicago, Milwaukee, St. Paul & Pacific at Milwaukee, Wis., has been appointed assistant mechanical engineer.

Master Mechanics and Road Foremen

J. S. Bell, assistant master mechanic of the Pittsburgh division, on the Pennsylvania, has been promoted to master mechanic of the Middle division, at East Altoona, Pa.

H. C. Wright, master mechanic on the Middle division of the Pennsylvania, with headquarters at East Altoona, Pa., has been transferred to the Juniata shop.

Barry Glen has been appointed master mechanic of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Miles City, Mont.

J. G. Danneberg, who has been appointed master mechanic on the Atchison, Topeka & Santa Fe at Arkansas City, Kan., as noted in the May issue of the *Railway Mechanical Engineer*, was born on May 28, 1896, at Kansas City, Kan. On November 17, 1913, he entered the service of the Santa Fe as a machinist apprentice at the Argentine enginehouse. He completed his apprenticeship on August 11, 1917, and worked as a machinist at Argentine, Kan., and Emporia, Kan., until September 22,

J. G. Danneberg

1923, when he became day enginehouse foreman at Emporia. He became day machinist gang foreman at Emporia on August 6, 1931, and master mechanic at Arkansas City on April 15, 1942.

G. R. Thomas has been appointed road foreman of engines of the Kootenay division of the Canadian Pacific.

J. L. Carmichael has been appointed road foreman of engines of the Revelstoke (B. C.) and Kettle Valley divisions of the Canadian Pacific.

W. A. Cunningham has been appointed road foreman of engines of the Canadian National, with jurisdiction over the Montreal terminals and assigned to Turcot, Que.

A. J. Pentland, district master mechanic of the Saskatchewan district of the Canadian Pacific has been transferred to Winnipeg, Man.

D. Beath, division master mechanic on the Canadian Pacific at Winnipeg, Man., has been promoted to acting district master mechanic of the Saskatchewan district, with headquarters at Moose Jaw, Sask.

G. S. Webb, assistant master mechanic of the Pennsylvania at Columbus, Ohio, who has been appointed master mechanic, with headquarters at Chicago, as announced in the April issue, was born in New Athens, Ohio, on April 20, 1897. After his graduation in 1920 from the University of Illinois, where he studied railway electrical engineering, Mr. Webb entered the service of the Chicago Elevated Railroad and the Chicago, North Shore & Milwaukee. On October 22, 1920, he became a draftsman in the electrical engineer's office on the Pennsylvania at Altoona, Pa. He then served, successively, as special electrical apprentice, motive-power inspector and assistant master mechanic on the West Jersey & Sea-

G. S. Webb

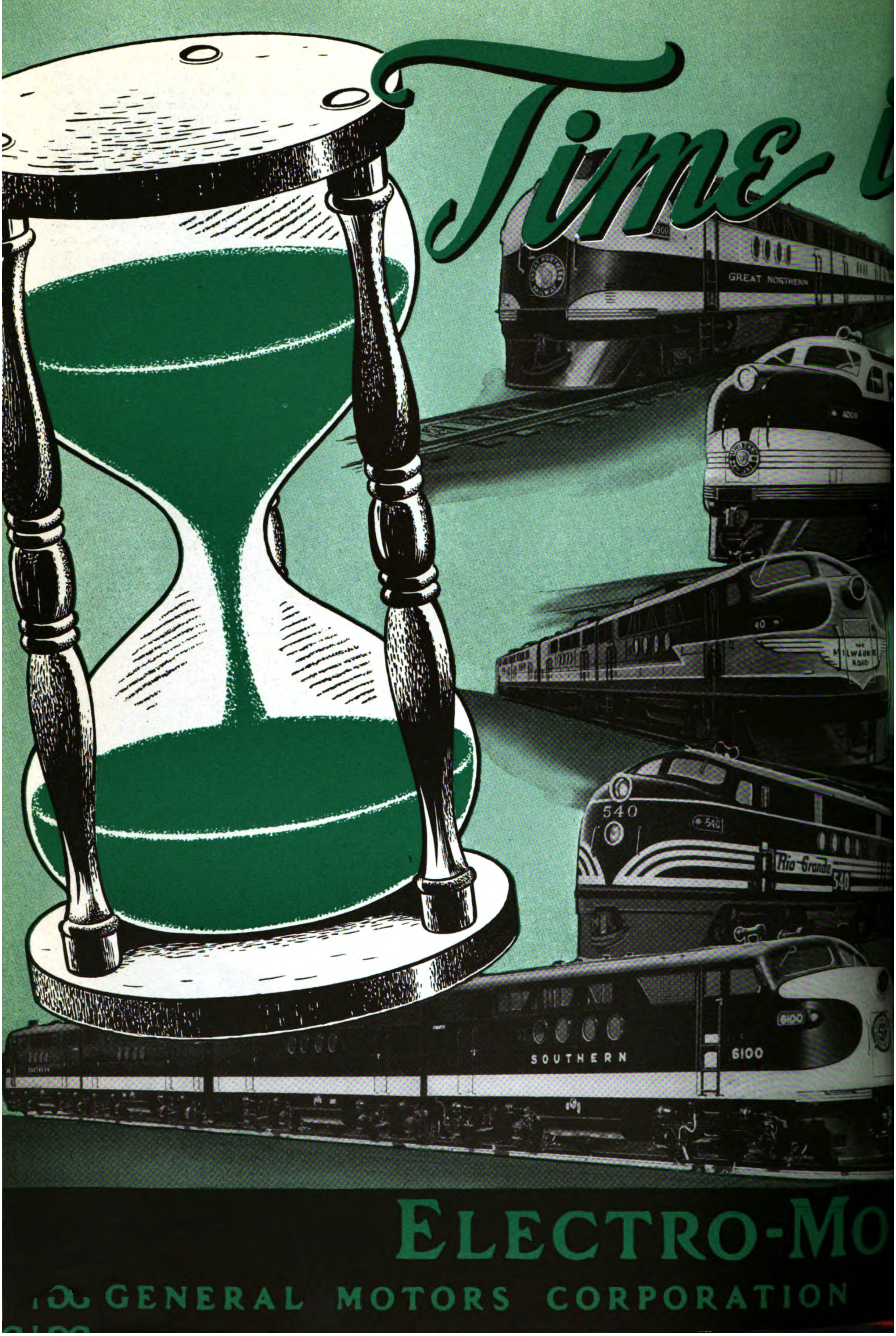
shore, Long Island and Philadelphia Terminal division of the Pennsylvania. Mr. Webb was later assistant foreman in the electrical engineer's office; foreman of the Wilmington electrical shop; general electrician of the eastern region, and most recently assistant master mechanic at Columbus.

Alfred Boyd Atkinson, general foreman on the Illinois Central at Centralia, Ill., who has been appointed master mechanic, with headquarters at Memphis, Tenn., as noted in the May issue, was born on February 5, 1895, at Summit, Miss. He

A. B. Atkinson

attended high school for three years and entered the service of the Illinois Central on August 7, 1912, as a machinist apprentice at McComb, Miss. From August 7, 1916, to January 1, 1918, he was a machinist at McComb. On the latter date he became dead work foreman. He was again a machinist at McComb from March

(*Continued on second left-hand page*)


Time i
GREAT NORTHERN
540
Rio Grande
SOUTHERN
6100
ELECTRO-MO
GENERAL MOTORS CORPORATION

1, 1918, until April 21, 1926, when he became air-brake machinist at Gulfport, Miss. He became night work foreman at Gulfport on September 16, 1926; extra work, on September 28, 1929; machinist at Asylum, Miss., October 31, 1929; machinist at Canton, Miss., May 16, 1931; machinist at Asylum, August 6, 1932; engine dispatcher, June 16, 1933; gang foreman, July 1, 1936; general foreman, July 15, 1939; general foreman at McComb, May 1, 1940; general foreman at Centralia, February 16, 1941, and master mechanic at Memphis, March 1, 1942.

Car Department

C. E. Barrett has been appointed general car foreman of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Minneapolis, Minn.

E. Buchholtz, general car foreman of the Chicago, Milwaukee, St. Paul & Pacific at Minneapolis, Minn., has been transferred to the position of general car foreman at Chicago.

H. L. Ewing, general car foreman of the Chicago, Milwaukee, St. Paul & Pacific, has been promoted to the position of general car-department supervisor, Northern district, with headquarters at Minneapolis, Minn.

A. C. Schroeder, general car-department supervisor of the Northern district of the Chicago, Milwaukee, St. Paul & Pacific at Minneapolis, Minn., has been transferred to the Southern district, with headquarters at Chicago.

F. J. Swanson, general car-department supervisor of the Southern district of the Chicago, Milwaukee, St. Paul & Pacific at Chicago, has been granted a leave of absence to enter military service.

Norman H. Camp, car foreman of the Chesapeake & Ohio at Handley, W. Va., has been appointed assistant general car foreman at Columbus, Ohio.

D. L. Ringler has been appointed general car inspector of the Texas & Pacific, with headquarters at Dallas, Tex., temporarily in place of J. D. Clyde, Sr.

C. G. Miller, car foreman on the Norfolk & Western at the Pulaski shops, Pulaski, Va., has been transferred to Bristol, Va.

A. O. Walker, tool car foreman of the Chesapeake & Ohio at Clifton, Forge, Va., has been promoted to the position of car foreman, with headquarters at Handley, W. Va.

W. I. Stultz, car department gang leader on the Norfolk & Western, with headquarters at Shaffers Crossing, Roanoke, Va., has become car foreman at Pulaski, Va.

Chas. A. Jordan, general car inspector of the New York, Chicago & St. Louis at Cleveland, Ohio, has been appointed to the newly created position of assistant to superintendent car department, with headquarters at Cleveland. Mr. Jordan entered railway service in 1915 with the Chesapeake & Ohio in the mechanical engineer's office at Richmond, Va. He became engineer of freight-car construction in 1924, and in 1929 was transferred to Cleveland as elevation engineer—cars, in the office of chief mechanical engineer of the Advisory Mechanical Committee of the C. & O., the Erie, the New York, Chicago & St. Louis, and the Pere Marquette. In 1933 he was appointed chief draftsman—cars, in the same department, and in 1937 became general car inspector of the Nickel Plate.

Orlin Hoyd Clark, general car inspector of the Gulf Coast Lines and the International-Great Northern (both parts of the Missouri Pacific), with headquarters at Houston, Tex., who has been appointed assistant superintendent of the car department of the Missouri Pacific at St. Louis, Mo., as noted in the May issue, was born on July 22, 1897, at Borden, Ind. Mr. Clark attended high school and commercial law school at Louisville, Ky., for two years. On November 20, 1914, he entered the employ of the Louisville & Nashville at Louisville and served successively as car repairer helper, car repairer, A. A. R. checker, A. A. R. clerk, chief A. A. R. clerk and traveling A. A. R. inspector On October 25, 1924, he began service with the Missouri Pacific at St. Louis as assistant general car inspector, and on July 24, 1926, was appointed supervisor car repair bills at Houston, Tex. He became general car inspector on February 15, 1939.

O. H. Clark

Shop and Enginehouse

K. E. Flora, work inspector of the New York Central at Beech Grove, Ind., has been promoted to the position of piecework inspector.

J. H. Staley, piecework inspector of the New York Central at Beech Grove, Ind., has been promoted to the position of assistant foreman.

Otto Hildebrandt, assistant foreman of the New York Central at Beech Grove, Ind., has been promoted to the position of foreman.

E. K. Staley, assistant foreman, boiler department, of the Chesapeake & Ohio at Huntington, W. Va., has been promoted to the position of foreman, boiler department, with headquarters at Huntington.

J. J. Stopek, work inspector of the New York Central at Beech Grove, Ind., has been promoted to the position of piecework inspector.

J. W. Brooks has been appointed assistant foreman, boiler department, of the Chesapeake & Ohio, with headquarters at Huntington, W. Va.

Purchasing and Stores

N. L. Satchell, storekeeper of the New York, Ontario & Western, at Middletown, N. Y., has been appointed general storekeeper.

N. T. Womack has been appointed assistant purchasing agent of the Texas & Pacific, a newly created position, with headquarters at Dallas, Tex.

Arthur N. Crenshaw, assistant purchasing agent on the Great Northern, at St. Paul, Minn., has been promoted to the position of purchasing agent, with the same headquarters.

Abner H. Lillengren, purchasing agent of the Great Northern at St. Paul, Minn., has retired on account of illness.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

Bronze Welding Alloys.—Bridgeport Brass Co., Bridgeport, Conn. Bronze welding suggestions with information of the rods available and their characteristics.

◆

Eureka Tool Steel Welding Wires.—Welding Equipment and Supply Company, Detroit, Mich. Information on the reclamation of worn tools and the opportunities for composite construction of new tools.

◆

Welding Rods.—The American Brass Co., Waterbury, Conn. A description of Anaconda welding rods with fairly detailed explanations of their uses and methods of application by various welding practices.

◆

Safety Equipment Catalogue.—American Optical Co., Southbridge, Mass. A description of the complete line of welding accessories to protect workmen. Also includes other shop safety equipment for individuals.

◆

Tungsten Electrodes.—Vascoloy-Ramet Corporation, North Chicago, Ill. Four-page Bulletin W-421. Describes pure tungsten electrodes for atomic hydrogen welding, with specifications of full range of sizes of these electrodes.

Railway Mechanical Engineer

July
1942

FOUNDED IN 1832

Published monthly by Simmons-Boardman Publishing Corporation. 1309 Noble Street, Philadelphia, Pa. Entered as second-class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, $3.00 for one year, U. S. and Canada. Single copies 35 cents. Vol. 116, No. 7.

RAILWAY MECHANICAL ENGINEER

Founded in 1832 as the American Rail-Road Journal

With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office.

Volume 116 *No. 7*

JULY, 1942

Published on the second day of each month by

Simmons-Boardman Publishing Corporation

1309 Noble street, Philadelphia, Pa. Editorial and Executive Offices: 30 Church street, New York, and 105 West Adams street, Chicago. Branch offices: Terminal Tower, Cleveland; 1081 National Press bldg., Washington, D. C.; 1038 Henry bldg., Seattle, Wash.; 550 Montgomery street, Room 805-806, San Francisco, Calif.; 530 W. Sixth street, Los Angeles, Calif.

Subscriptions (including, when published, the daily editions of the Railway Age, published in connection with the convention of the Association of American Railroads, Mechanical Division), payable in advance and postage free, United States, U. S. possessions and Canada: 1 year, $3; 2 years, $5. Foreign countries, not including daily editions of the Railway Age: 1 year, $4; 2 years, $7. Single copies, 35 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.), and is indexed by the Industrial Arts Index and also by the Engineering Index Service. PRINTED IN U. S. A.

"Drafted into Service" for new uses

The statement that A. M. Byers Company can satisfy the staybolt iron requirements of every railroad in the country must be revised temporarily—in view of current conditions.

The capacity is still there, and working overtime. More genuine wrought iron rounds are being rolled than ever before. But unprecedented quantities have been "drafted into service" for *new* uses.

In producing wrought iron to meet the most exacting requirements of staybolt iron users, unusually high and uniform quality is regularly obtained in chemical and physical properties, dimensions, and straightness. Modern control equipment permits continuous maintenance of uniformity, and accurate duplication of past shipments at any time.

These same advantages, coupled with the corrosion resisting and fatigue resisting properties of wrought iron, made the wrought iron rounds ideal for important war applications. And tonnage demands are so great that only a completely modern mill can hope to meet them.

This expanded use of wrought iron is still further confirmation of its value as a staybolt material. If you have not had first-hand experience with it, we shall be glad to furnish you with samples for test.

A. M. Byers Co., Established 1864. Sales Offices in Pittsburgh, Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

CORROSION
COSTS YOU MORE THAN
WROUGHT IRON

BYERS
GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS

Conservation, Substitution, Reclamation

Under these titles the materials problems of the railroads were thoroughly canvassed at semi-annual meeting of the American Society of Mechanical Engineers at Cleveland on June 10—Addresses by Eastman and Stevenson—About 250 railway and supply men in attendance

THE problems of the railroads with respect to materials needed for the maintenance of track as well as of cars and locomotives were discussed at the railroad sessions of the semi-annual meeting of the American Society of Mechanical Engineers held at the Hotel Statler, Cleveland, Ohio, June 8 to 10, inclusive, in a program dealing specifically with conservation, substitution and reclamation. The railroad program, which was sponsored by the Railroad Division of the society, occupied both morning and afternoon sessions on Wednesday, June 10. Following the morning session luncheon was served for all those attending. The registration indicated that about 250 persons were present.

Three Addresses and Three Papers

In addition to the three papers, one on each of the above subjects, there were addresses by Joseph B. Eastman, director, Office of Defense Transportation, and by Andrew Stevenson, chief, Transportation Equipment Branch, War Production Board. Following Mr. Eastman's address in the morning, Col. James L. Walsh, chairman, War Production Committee, A.S.M.E., delivered a short address on the subjects of logistics in which he drew a vivid picture of the task facing the United States in the present war and emphasized the tremendous importance of transportation both within the United States and between the United States and the various zones of military combat throughout the world. He pointed out specifically some directions in which engineers can be of assistance, particularly in reducing the demands on both ships and land transportation facilities.

The paper on conservation was prepared by A. G. Hoppe, assistant to the mechanical assistant to the chief operating officer, Chicago, Milwaukee, St. Paul & Pacific, who suggested, among other things, a return to a more intensive use of the forge shop to reduce the amount of material removed in the machine shop. C. B. Bryant, engineer tests, Southern, in his paper on substitution reviewed the Mechanical Division program looking toward the development of substitutes for copper and tin. G. A. Goerner, general storekeeper, Chicago, Burlington & Quincy, presented a reappraisal of the problems of reclamation in the light of the new emergency conditions. Taken together, the three papers presented a striking picture of swift adaptation to the sudden curtailments of customary supplies of materials and changes in habits with respect to the use—and misuse—of materials in which the exercise of ingenuity by the industry as a whole on an organized basis, as well as by individuals, has been outstanding.

The program was developed by the Meetings and Papers Committee of the Railroad Division, of which W. M. Sheehan, assistant vice-president, sales, General Steel Castings Corporation, is chairman. In addition to the formal addresses, the chairman called on James W. Parker, president of the society, and on Roy V. Wright, editor, *Railway Mechanical Engineer,* for brief talks during the course of the meeting.

Both sessions were presided over by D. S. Ellis, chief mechanical officer, Chesapeake & Ohio, the chairman of the Executive Committee of the Railroad Division. At

the morning session he called upon G. D. Brooke, president, Chesapeake & Ohio, to introduce Mr. Eastman. At the afternoon session he called upon W. E. Woodruff, president, Erie, to introduce Mr. Stevenson.

General discussions followed the formal presentations of the papers at both the morning and afternoon sessions. Summaries of the addresses and abstracts of the papers follow.

Eastman Urges No Letdown Now Or After the War

Railroads are the backbone of transportation—Existing high standard of performance must be maintained—Competition after the war will be great

"THE railroads are now the backbone of the transportation industry without any question. I think they will remain so, but it is going to be necessary for the managements to keep on their toes, to keep the fires of imagination and creative ability blazing all the time if they are going to keep up with the procession." With these words in his A. S. M. E. address, Joseph B. Eastman, director, Office of Defense Transportation, expressed his appraisal of the future of transportation. Mr. Eastman commented upon the governmental assistance which had been given the aeronautical industry in the development of testing laboratories and stated that he had tried, in his earlier assignment as coordinator, to further a plan for a centralized scientific engineering research department covering equipment design and operating problems in the railroad field.

Recalling that this plan, which was recommended by outstanding industrialists as well as railway operating officers, had not been carried out, Mr. Eastman suggested that, in view of the tremendous amounts of money being spent in one way or another by the government on the air-carrier industry, water-carrier industry, motor-carrier industry, the government might be willing to devote a little money to experimentation to enable the railroads to have a place where their equipment and facilities can be tested. He said that he looked forward to the time when steam locomotives will not be made to order and when a higher degree of standardization will be attained in car construction, and even in track equipment construction; when the claims of "super-salesmen" would be tested in the laboratory, as are the products entering into the construction of airplanes.

Record of Railroads Excellent Up to Date

"Up to date the railroads have an excellent performance record to their credit," said Mr. Eastman. "They started in 1939 when the emergency began with the invasion of Poland. They had planned for this emergency, largely as a result of what happened during the last war. They had a centralized department in the Car Service Division of the Association of American Railroads. In addition to that they had established an effective liaison for cooperation with the shippers through the Regional Advisory Boards. They also had the benefit of the Bureau of Service of the Interstate Commerce Commission."

"In 1941 the railroads carried more ton-miles than ever before in their history and they did it with about one-third fewer cars than they had in 1929. It has been an excellent performance and, so far, there has been no congestion of any importance. Whatever the railroads have been called upon to do, whether it was movement of munitions or raw materials, or of troops and impedimenta, it has been done well."

The diversion of freight formerly handled by water carriers, including transcontinental traffic and petroleum movements to the eastern seaboard, coal shipments to New England, former Great Lakes traffic, and added rail hauls of freight from South Atlantic ports that formerly arrived at eastern ports, impose great strains upon motive power as well as the rolling equipment of railroads, said Mr. Eastman. He pointed out that because of the longer hauls involved in connection with so much of the freight moving today that carloadings, formerly the standard index, should be replaced by freight ton-miles in measuring traffic volume. At the present time ton-miles are increasing at a rate more than double the rate of carloadings. One thing which helped greatly in preventing car shortages, he said, was the effect of General Order No. 1 which led to heavier loading in l.c.l. cars. More of this type of traffic is now handled, using 40 per cent fewer cars, than was handled in 1941.

How About New Cars and Locomotives?

Expressing his belief there might be an additional increase in the traffic load that rail carriers must handle because no more trucks are being built and the rubber shortage may force existing trucks off the highways, Mr. Eastman pointed out that additional problems will arise in the demand for more railroad equipment. "We might look forward to these strains upon the railroad service with equanimity, were it possible to get cars and locomotives without any difficulty," he said. "But that is not the situation. They have to be built out of steel and other critical war materials, and the demand for these critical materials is greater than our present supply because of the immense war production program which embraces not only the armaments, munitions of war, naval vessels, but also the tremendous flotillas of ships which are being built to carry these things across to where they can be used, and also the synthetic rubber plants which have to be built to take the place of thousands of square miles of rubber plantations which are in the hands of the enemy.

"On account of all those demands upon critical materials," he continued, "the War Production Board naturally is disposed to look with reluctance on allotting steel for the construction of cars and locomotives. They haven't allotted as much steel for that purpose as I wish they had. They are relying in that connection upon what they believe to be the capacity of the railroad industry, and I mean by capacity its mental capacity, and upon its reserve strength and ability to take up slack.

"That is a challenge to the railroad industry and I know that the railroad industry will do everything in its power to meet it. A great deal depends upon the imagination of the mechanical engineers, on their powers of improvisation and ability to act quickly."

Maintenance Material Vital

"Two things I should like to mention, particularly," Mr. Eastman said. "I asked Phillip Hollar, head of my section on materials and equipment, if there was anything he would like to have me say to you and he said, 'I wish you would call their attention to the field of scrap.' I said, 'I thought that field had been combed over again and again in the last two years, and the railroads had collected all the scrap there was.' He said, 'I think there is still some you can find around the shops, for instance old rails which you find used for steel posts and enclosures.' He said, 'If they look carefully over the situation in all the shops, they will still find quite a little scrap which it is possible to reclaim.'

"The other thing to which I want to call your particular attention is the question of maintenance. One reason why the railroads have done as well as they have done—and that has been excellent so far—is because they have been able to keep their equipment in good repair. They have reduced the percentage of bad-order cars and locomotives down to the lowest percentage on record. They have got to keep that up, in view of the fact that they are not going to have an abundance of new locomotives and cars, if they are going to maintain their performance. That makes the maintenance question of supreme importance.

"I was considerably worried when I heard that there was a possibility that the War Production Board might in the latter part of this year shut down the supply of maintenance materials in whole or in part. I hope you will watch that matter very closely, and if you see any danger in sight, let us know in Washington at once. I can't conceive of anything that is more critical and more important than keeping this equipment that the railroads have in topnotch condition. Of course, you ought to use all the devices you can through reclamation and substitution and conservation to make the supplies you have go as far as possible."

Mr. Eastman called attention to the fact that there seemed to be an increasingly unfavorable ratio between railroad accidents as compared with traffic increases. He indicated that, with respect to older classes of tank cars and other equipment, he was concerned with respect to their ability to stand up under the strain of their present intensive utilization, and asked that his office be kept informed of "signs that point to danger ahead."

Post-war Competition Will Be Great

Speaking of the problems of post-war competition at the conclusion of his speech, Mr. Eastman said, "I recall a famous character who, speaking of his enemies, said: 'If you can't lick them, join them.' And that might be something to think of in connection with the motor carriers and the air carriers. Already you can use the motor truck to great advantage in railroad operations. It is being used extensively, and you may be able to do more. You may be able to do it in the case of the airplane as well. In the meantime, I know that the railroads are going to work with the shippers, and with each other, and with other forms of carriers, and with the government to keep everything rolling to the utter confusion and defeat of our enemies."

Stevenson Optimistic As to Materials for Maintenance

The fact that the armed services need the same things that the railroads do intensifies the problem — Substitutes are being developed

In making the comment that "As far as we can tell, there is no reasom why, in the third quarter we should not receive all of the material that is being requested for maintenance," Andrew Stevenson, chief, Transportation Equipment Branch, War Production Board, in his A.S.M.E. address, offered an answer to a question that has been of serious concern to those who are charged with the responsibility for maintaining equipment. The comment, however, carried a word of caution when, in continuing, he said, "But while we will get material for maintenance, it doesn't mean necessarily that we will be able to be wasteful or profligate or have too many A-and-B items out of our maintenance account."

In the first part of his talk on the materials question Mr. Stevenson commented on the rapid changes that have taken place which have of necessity had an important influence on the policies and decisions of the O.P.M. and the War Production Board during the past seven months. Before war was declared, in December, the problem was materials and the development of methods to assure that they would be used where the need was the greatest. Priorities was the problem of early December. With the outbreak of the war, however, the second aspect, not materials but want of production, arose and caused the organization of W.P.B. The emphasis, since the middle of May, has again swung back to materials. "So good a job has been done" said Mr. Stevenson, "that we are confronted again today with an even more severe and tight situation for materials needed to keep converted plants going in the production of war goods.

"So it is on that basis that public announcement has been made that we would postpone, if not refrain entirely from building certain contemplated plant expansions. It is on that basis in part that certain conversions of plants are temporarily deferred. True, here and there, and especially I think in the case of railroad shops, as a result of our agreement on May 11, there are certain machine tools from which we need to obtain machine-tool hours.

"But by and large I think the problem now is one of getting sufficient materials to keep what we already have in war production running at full speed. This is evident more particularly in the railroad industry because this industry competes with the military effort probably more severely than any other industry. Copper, rubber, iron and steel—not only the over-all materials, but particular items like plates, shapes, bars, castings—are essential to the military effort, and they are items that we take in great quantities.

"As a consequence, this increased tightness of materials we felt in our work, and are feeling, and will feel more severely. It is on this shortage of materials, I think, that we can describe the closing down of the new freight-

car and passenger-car construction. Two hundred thousand tons of steel per month simply cannot be spared to build freight cars. It's on this basis that we have L41, the construction order, with which the War Production Board is seeking to curtail the amount of construction.

How Tightness Affects Maintenance

"Now with the tightness of materials, we are worried about maintenance. I think that I have sufficiently outlined for you the locomotive situation, which is one of production; the car is one of tightness of materials; but maintenance is our chief problem. In this particular, the railroads have done an especially good job, and this last week, as we have gone over the new 351 form which is filed under P88, we have been particularly pleased to see the manner in which the various engineers, together with the purchasing agents, have recognized the situation and are asking for what they feel they need to get along, but not necessarily need to build up additional inventory.

"As far as we can tell, there is no reason why in the third quarter we should not receive all of the material that is being requested for maintenance. That is as far as I can judge from these 351's. But while we will get material for maintenance, it doesn't mean necessarily that we will be able to be wasteful or profligate or have too many A-and-B items out of our maintenance account.

"We have several especially tight spots. You all know the announced shipbuilding program of 8,000,000 tons this year, and we hope to have more. You know the announced program of about double that next year. Now you know what that means in terms of plate. As a consequence, realizing that the plate situation would be far tighter, we have asked that you go over to composite cars, so that the plate on hand, regardless of the fact that it might be used in completing cars under the present design, might be saved for necessary repairs. I appreciate that there is some adjustment which has to be made in that case.

"We have also asked in that particular that we go over to narrow plate, insofar as possible, on locomotives and also in locomotive repairs. To the extent that we can free these wide plate mills from our demands, and others, we will be successful, I think, in receiving the plate that we need for absolutely necessary maintenance.

"We must face the fact, however, that, in the light of this shipbuilding program and in part the tank program, we will not get all the plate we need for a heavy repair or rebuilding program. I am reluctant to bring it up, but I think we might as well appreciate that we may be confronted with this dreadful word 'patching.'

"Now again, in the matter of plate, I believe the railroads have assisted us a great deal, and shown splendid cooperation, especially in this tank-car plate, which Mr. Hawthorne informed me this noon had now been approved, which is the use of thinner gauge for special tank cars which are not contemplated to last the equivalent life time of our heavier plate.

"Shapes too are involved in shipbuilding. And as we have started to build a few plants, especially in the case of rubber, that have been too long delayed, the ratio between plates and shapes, narrows. We use more shapes per ton of plate than we do in the case of ships. As a consequence, the shape situation has been unusually acute, and this month we have deferred some 36,000 tons of rail to July, in order that we may roll shapes on the rail mills.

"Castings also have been tight. One week plate is the worse thing, and the next week it's shapes, and the following week it's castings, and the next week it's plates again. We never really know when we have one thing licked for good. As a matter of fact, we can't expect it. I think, however, the casting situation should ease, especially in view of the decreased freight-car building program.

"On rail, the material situation has not yet shaped up to the acuteness that we will not get our 1,260,000 tons. However, that is conditioned on the release of relay rail. In that again, I wish to express my appreciation here for what has been done in the case of taking shorter joint bar. The use of the 24-in. bar which goes into effect shortly will relieve us on tonnage that we vitally need. That should be followed up in the matter of tie plates and frogs.

"Lumber, too, right now is tight; we are taking about a quarter of our year's output to build certain army camps. That should ease in maybe 60 or 90 days. But copper and nickel are the worst of all of them.

"What has been done on journal brasses following our discussion last December, has probably been one of the most significant things in indicating to the Board the cooperation that the railroads have given and are continuing to give in the conservation of materials.

"Now I am delighted that Mr. Pearce, as he has expressed to me today, feels that we now have one that will take the railroads out of the primary copper market for sometime.

The Purpose of Standardization

"In standardization which we discussed before, we were concerned on two counts, one on locomotives, and one on cars. The reason in looking toward standardization of freight-car design last December and January, was that, when the closing down of freight-car production came, which we knew was coming, we could balance up the inventories.

"Unfortunately we did not quite reach that standardization picture as far as the cars that were under construction last April were concerned. However, owing to the splendid efforts of Mr. Hawthorne, Mr. Irving, and others, at a meeting that we had some two weeks ago, I believe we have been able successfully to take care of most of the inventory.

"In locomotives we are looking toward standardization in a loose sense—the use only of designs that previously had been employed. We are looking toward that type of freezing of design with the idea of production. There have been some departures by the railroads and the builders from those designs, but we intend to insist on them.

"The locomotive picture has always been one of concern to the Transportation Branch. As a matter of fact I think we were a 'voice crying in the wilderness' as far back as the Advisory Commission days in the matter of power, feeling that as the material situation became tighter and a choice had to be made between cars and locomotives, that we would take the locomotives. We are hopeful that we can build these locomotives this year. It is going to call for exceedingly fine co-operation between the builders and the suppliers and it is going to call for very active participation of the mechanical departments of the railroads, in some cases to build locomotives, in some cases to assemble them, and certainly, in many cases, to manufacture parts for the locomotives if we are going to come anywhere near meeting our domestic and foreign program.

"In the production of these locomotives I hope we can

continue to carry out our various agreements, and understandings on the elimination of a number of specialties. They are not only causing us concern, production-wise, but more particularly in the matter of the materials consumed.

Tighter Materials Require Tighter Controls

"The material situation is getting tighter. Therefore the material controls must be tighter. About that I am sorry and disappointed, because I would like to see the least amount of reporting possible to Washington. Preference ratings, as such, as you well know, are only permissive and simply give a man a certain rating, saying that he comes behind somebody else in the securing of new material. Our allocations are different. They supposedly guarantee a certain amount of material.

"The same way on railroad maintenance, and under the materials used by the railroads, we are giving 50 per cent A1-C, and 50 per cent A1-J. But when we come down to an actual allocation as such, we must know not only what we need, and what we are using, but where that particular material is coming from, insofar as it is taken from some other industry.

"As a consequence the War Production Board has gone over to a reporting G275 form and a PD25A, and has issued a new regulation No. 10 in which all industries are given a number, and all purchasers must place this number on their orders, and the order be carried on down through every supplier.

"To some degree, our 351 under the P88 preference-rating order that railroads have, is excluded from this overall materials control, which every other industry must follow, but our form is the same except for certain changes that we feel we need for our industry.

"I mention this last point because I hope that you engineers will appreciate that the life of a purchasing agent is not easy. He comes to Washington and talks with our men, and perhaps comes back and disappoints you very greatly in that he doesn't have certain material. But I hope that you will help him by cutting down on some of those requests at the source, and by watching insofar as you can, the total amount of material you ask for, as well as the specific kinds. I urge that not especially because I think there has been a laxity in the matter up to now, because I think we have had excellent assistance and co-operation on the matter, but because of the purchasing agents who walk out of our place saying, 'I don't know how I'll explain that back home.'

"There was a time when I knew that certain items that we were not getting, were going to industries that I thought were not very essential. At that time we never let up for an instant in trying to get even more than the railroads had asked for. But we know now where these materials are going, and we know especially in the railroad items how directly competitive they are with military necessities, both in army and the navy equipment.

"So I think that all of us should get together without regard to whether our department, or the purchasing agent's department, is charged with the responsibility of conserving materials, or whether it is the practice to clear through the President's office before going to the W. P. B., and see that we are saving on materials."

"Three Hundred Panama Canals in One Year"

Thus the speaker described the war production task — Engineers can save transportation by designing for light weight and reducing bulk

By Col. James L. Walsh

Chairman, War Production Committee, American Society of Mechanical Engineers

You have heard the expression recently that this is a quartermaster's war. I suppose that the word "quartermaster" was used largely in a sense of supply because the quartermaster doesn't have to do with all kinds of supplies any more. He doesn't even have to do with moving all kinds of supplies as he did until recently. The movement of supplies has become so very important that an entirely new corps has been established in the army called the Transportation Corps.

The Magnitude of Our Job

With the recent request by the President for an additional 39 billion dollars for the fiscal year which begins in a few days, it would indicate that during the next 12 months, beginning July 1, there will be an activity of one kind or another related to the war, represented by a total of 110 billion dollars. The Panama Canal took 10 years to build. Roughly, what we are tackling beginning July 1 is a job equivalent to the building of 300 Panama Canals in one year; that's not very far from one a day. The Empire State Building is 102 stories high. It's equivalent to building 2,200 Empire State Buildings in a single year!

That's just the overall measurement, just taking money as the least common denominator to show what we are facing, the first of July; what Mr. Eastman is facing, utilizing all the transportation available. And if you think it's going to be easy to do that, you're going to be very sadly mistaken. It can be licked, but it's not going to be licked by letting Eastman do it. It's going to be licked because you and I, wherever we happen to be, lend a hand in licking it.

Ships — And More Ships!

One thing we ought to bear in mind as a very essential factor in this situation is that eventually we will have to lick the Japs, no matter what we do first. To lick them, we have got a seaborn line that will average 12,000 miles. At present, the Japs have a seaborn line of communication of around 1,500 miles. That, if my arithmetic serves me rightly, is a ratio of 8 to 1. The number of ships required is determined by the relative length of the lines of communication. So, roughly, we have got to outbuild the Japs 8 for 1, in order to get an even break.

You can read the papers of the number of ships we

are launching, and the number of ships that the Germans are sinking. I won't go into the exact details on that, but there certainly isn't very much net gain. In fact in some weeks there has been a definite loss; they are sinking more ships than we are able to launch. On top of that, they are building submarines faster than we are sinking submarines.

These things may have little to do with the railroad industry, but it seems to me if you get a proper background of this situation, you can get the feel of the things that are coming, the load that is going to be on the neck of the railroad industry, because that, at present, is the only industry that we can count on logistically—moving materials to the fighting fronts.

Modern Concept of Logistics

I looked up this word "logistics" and it said in one dictionary, "the science of supplying armed forces in the field." I think that is about as up-to-date as saying that war is a duel between professional armies. To the civilians that have been killed all over the world, certainly that is not their understanding of war, as a duel between professional armies. That is no longer the case.

War nowadays is between entire nations with every soul in them, and groups of nations. It covers every individual man, woman and child from the maternity hospital to the verge of the grave. It catches the churches, and the schools, and the homes, as well as the factories and the forts. We are all in it, in the army now. We are all targets, as a matter of fact.

Due to the fact that transportation is necessary, that food and other equipment is necessary to maintain the civilian populations of the United Nations in order to keep them in the war on our side, that is also a military function. So that eventually we come down to the conclusion—it seems to me it is inescapable—that we are facing for survival one single completely integrated, highly complicated problem in logistics, to keep the United Nations and their civilian populations alive; to keep their forces in the fight until we can arm, equip and transport armed forces to where they can be effective.

That leads to another thought. There isn't one thing that we do from the time we get up in the morning until we go to bed at night, not any of us, but has its effect either for plus or minus on the outcome of the war. Figure these things through, and see their effect.

You take the sugar in your coffee as an example. We Americans are prone to put a spoonful in, and put a little more in; down goes the coffee, then look in the cup, and half the sugar is still in there. What effect has that on the war? It would take a fifth of an acre of sugarcane to produce the alcohol necessary to produce the powder to fire a single round in the jungle, perhaps in Corregidor. That's the interconnection between these events. That's the thing we can do.

Here we are in a hotel. They put plenty of nice towels around, and we use one, and throw it aside; and then we use another one, and throw that aside. It's all included in the price. And we leave a few lights on. There's not enough chlorine available today even to experiment with making decontaminants against mustard gas. And this chlorine can come only out of things like either the purification of water supply or the bleaches the laundry and textile people use.

We need that chlorine, so just as a tip for the future, don't be too careless with your towels, either at home or in the hotel. They are all interconnected, every one of them, and I think you've got the sense to see that interconnection.

Cut Down the Bulk

Now, why am I talking about this? I want you to help Joe Eastman. You can help him in your design, your material, your apparatus, your machines. You engineers can help by designing nearer to a factor of safety of unity, as we have to do in the army, in order to cut down on weight. Why do we engineers use factors of safety of three, four or five if it is not necessary—just mental laziness? We are in a serious situation now in which we can no more afford to over-estimate than we can to under-estimate. Take the small matter of packages. The forest products laboratories in Wisconsin developed a crate for shipping automotive engines abroad, and they cut down the bulk by 15 or 16 per cent. Now what does that mean in the logistic sense? It means that out there in Wisconsin they were building ships, didn't it? They cut down the bulk so that five ships would do the work of six, bulk being the determining factor. Do you know of any quicker way to build ships? Do you know of any way to pay for them more easily than not to have to have them to do the same job?

Now there are plenty of those things right under our noses. We have been criminally wasteful, and we are going to pay for it, not with money, maybe, but with our lives.

Be Safe and Save Transportation

Even children have got to get the sense that everything they do and don't do has an effect on the war. Little Willie leaves his roller skates on the front walk. Tell him he's helping Hitler. The mailman or somebody else comes along and falls and konks his head. First you telephone, and waste communication, of which we haven't enough. And you've got to have a doctor attend to him. We haven't got enough doctors today. Fundamentally the reason Willie is helping Hitler is because you have to get an ambulance to haul the man to the hospital. You have to use surgical tools, perhaps, and we don't have enough chromium to plate them. And we can't afford to use the rubber and the tires and the ambulance to cart anybody away.

If you think that is a small item, let's just figure it up.

War nowadays is between entire nations with every soul in them, and groups of nations. It covers every individual man, woman and child from the maternity hospital to the verge of the grave. It catches the churches, and the schools, and the homes, as well as the factories and the forts. We are all in it, in the army now. We are all targets, as a matter of fact.

Traffic deaths in any nineteen-month period—you can take back up to this last month—show around 40,000 killed by automobiles. We killed only 39,000 in 19 months of the World War by bayonet, bomb, shrapnel, and everything else. The automobile has been killing off regularly, month after month, the same high average we lost during the World War. We can afford to do without that sort of thing.

But even in your own home, at the same time we are losing 40,000 on the highways, we are losing 102,000 needlessly at home—people slipping on the soap in the bathtub, or on the milk bottle on the back stairs. You can't afford that kind of luxury any more, and why? Because it absorbs transportation. That's the fundamental reason, that transportation is needed to support the boys wherever they may be. You know it just as well as I do, and every mile they go, it takes more and more transportation to supply them.

A War on Weight

So, you engineers, focus on a war on weight in the design of apparatus, gadgets, and so forth; cut down the bulk of your packages; cut down anything.

In 1935 they started building some standard freight cars that were six tons less in weight than the usual design. What would that have meant today if it had been followed through? Six tons per car unnecessarily lugged over the Continental Divide, 85 cars to the train. Figure that out. Think what that saving would have meant.

The solution of this problem is right in your hands, and I think you can solve it.

Conserve New Material Supplies Regardless of Cost

Emphasis must be changed from saving labor where it has been effected by prodigal use of material

By A. G. Hoppe

Assistant to the Mechanical Assistant to the Chief Operating Officer, Chicago, Milwaukee, St. Paul & Pacific, Milwaukee, Wis.

PRACTICALLY all materials that we deal with in our everyday work are critical to some degree. Some have been denied us altogether and we have had to resort to substitutes. In many cases we are already using substitutes for the substitutes, since a wholesale substitution of one material for another invariably causes the substitute to become critical. This cannot go on forever and we come rather abruptly to the proposition of making the best possible use of the materials we will be allowed to purchase.

A railroad repair shop carries on a diversified line of work and hence it is impossible in most instances to buy material to suit the job. The material is bought in bulk and has to be cut to fit the job. This applies to many different commodities such as steel sheets, plates, billets, bars and shapes; brass and copper sheets; rubber and composition packing; textiles, leather goods, and so on. Because of this method the layout men in the shops are in a key position and must be impressed with the importance of their part in the matter of conservation. Unless the layout man thinks first and plans his work so as to use as little material as possible, he can cause an untold amount of waste.

The engineering department can be of considerable assistance. A specific instance of this is found in the general employment of fabricated parts as substitutes for steel castings, which are assembled by welding. If the designer will use as few different thicknesses of material as possible, the layout man has a better opportunity to utilize his material to the best advantage. In this type of work bosses, gussets, and braces are commonly employed and the layout man will be able to fit these small parts between the larger portions. If necessary, shearing diagrams should be prepared. Complicated contours are often encountered in the design of a substitute for a steel casting, particularly if an attempt is made to reduce the welding to a minimum. However, by the judicious use of welds in strategic places, almost any complicated piece can be reduced to simple components which can be cut from a sheet or plate with little or no waste, whereas the cutting of the complete piece would result in considerable waste.

This procedure may not always be the most economical from the standpoint of labor or convenience, but our present purpose is to save material, and convenience and cost become secondary matters. We may also have to revise our ideas of housekeeping slightly and permit the accumulation of small pieces of material ordinarily scrapped for use as clips, gussets, bosses, etc.

Emphasis Transferred from Labor to Material

I believe it will be admitted that we in America have been very prodigal in the use of materials in our attempt to effect labor savings. To assist us in these efforts the machine-tool designers have placed machines at our disposal capable of removing large amounts of material in a minimum of time. The manufacturers of flame cutting equipment have produced devices which will permit of making complicated parts, as it were, out of the whole cloth from plates or billets, eliminating the necessity of forging. The aim has been the production of a given part at the lowest overall cost, even though in some instances, 50 per cent or more of the original material was cut off in the process.

In this respect the machine tools are the greatest offenders in that they make chips or shavings out of the material removed, and such waste is at best only rather poor melting scrap. Specific examples of this are locomotive valve stems, frame splice bolts, and similar turned objects. Where work of this type is of sufficient volume it can, no doubt, be shown that it is cheaper to machine out of bar stock than it is to forge down the smaller diameters or upset heads, etc., and set the pieces up individually for machining.

The flame cutting devices are not quite as wasteful, as here a clever operator can save considerable material by properly planning his work. Furthermore, the material which does fall off as unusable scrap has a higher value. However, the entire picture has changed with

respect to saving labor at the expense of materials. In fact, the present situation is such that unless we save material on which to use the labor, we won't have any material on which to save the labor.

Back to the Forge Shop

Undoubtedly the answer to the above is a return to more intensive use of the forge shop. In the case of the valve stems mentioned above, our engineering department made up a compromise forging from which it is possible to machine the valve stems used on any of our locomotives. The weight of this forging is only slightly more than half of the weight of the bar required to produce a valve stem by machining only, and in this case there was very little, if any, difference in the labor cost to forge and machine.

Similarly, in the production of larger forgings the part can be roughed out under a steam hammer and then finished more nearly to size with the torch at a considerable saving in material.

The matter of keeping down store stock, influenced also by convenience for the shop, has led us in many instances to try to make one rough part serve too many purposes. An illustration of this is the use of heavy-walled bronze bushings to serve as rough stock for a considerable number of finished bushings. Here again, machine tools can cut off material in a hurry, and it is convenient for the shop to set up a long, heavy-walled rough casting, and proceed to make almost an infinite variety of finished bushings. No doubt, by this procedure the stores department can protect a given number of articles with less total stock than would be necessary if each article were made from a separate pattern with a minimum allowance for finish. Our purchasing agent has been calling attention to this matter for many years pointing to the high ratio of bronze borings sold to the brass manufacturer, to the total bronze purchased. Apparently it took nothing less than a war to make us see the light.

Make Replacement Parts Hard to Get

In our efforts to save labor or time, we have made replacement parts too readily available. No doubt, in many cases it is cheaper or takes less labor to remove a given part by destroying it and applying a new piece. Sometimes this procedure is again purely a matter of convenience. Bolts, nuts, pipe and pipe fittings undoubtedly suffer most from this practice. The judicious use of wrenches will save much of this type of material. If necessary, cutting torches may have to be kept under lock and key and used only as a last resort and then with the approval of a supervisor. One of our shop supervisors at a recent meeting gave us an antidote for this practice when he said, "Make it hard to get." If we do make it harder to get new parts, the workmen and supervisors will think twice before removing a part by destroying it.

Similarly, parts are often renewed when a little ingenuity will keep them in service. Sometimes we may have to resort to methods considered questionable, but if the practice is safe and does not violate any regulations, it is certainly justifiable under present conditions. A case in point is the matter of loose driving-box brasses which in many instances can be tightened by the use of shims and rendered fit for further use. The rules for the inspection of steam locomotives recognize this practice and permit shimming of driving-box brasses provided only one thickness of shim is used.

In our efforts to keep existing parts in service as long as possible, full advantage should be taken of established limits of wear. This applies particularly to parts governed by regulations of either the Interstate Commerce Commission or the Association of American Railroads. Some of the railroads in an effort to avoid conflict with such limits have applied somewhat more stringent regulations to govern their own practices. The limits established by the above agencies undoubtedly are considered safe and more stringent limits are not justifiable under present conditions. Car wheels and locomotive tires are important examples of parts subject to such regulation, and every effort must be made to keep such parts in service as long as possible.

Grinding Car-Wheel Treads

An invaluable aid in the conservation of tread metal on car wheels is a suitable wheel grinder. The Committee on Wheels of the Association of American Railroads has long recommended the use of wheel grinders for grinding our flat spots on chilled-iron wheels for further use in interchange, and permits the use of chilled-iron wheels trued up because of out-of-round condition on the owner's cars.

Grinding is also advantageously used on wrought-steel wheels to remove built-up treads, and to restore worn treads in the absence of excessive flange wear. The latter is particularly applicable to wheels used in high-speed service where excessive tread wear cannot be permitted, and in most instances a tread can be dressed up several times before the height of the flange approaches the condemning limit. The advantage of grinding obviously is in the fact that only sufficient tread metal is removed to true up the wheel and restore the tread contour. When this is done by turning, it invariably results in a definite loss of at least 1/16 in. of tread metal since a cut of less than this is not practicable.

Non-Metallic Materials

So far we have discussed almost entirely metallic materials. Some of the non-metallic materials, while not used so extensively, are none-the-less equally important, and equally or more critical. Rubber apparently is, for the time being, unobtainable. From a purely conservational standpoint we can only impress on every one to take care of, save, and protect what rubber they now have, as it must last a long time. We can only point out that rubber products such as air, tool and welding hose, welder and battery-charging cables, etc., should be protected from mechanical damage and kept from contact with oil and grease. The length of such connectors should be kept at a minimum and any excess material saved for future use. This may require the installation of additional air or power outlets but this would certainly be justified.

Proper care and maintenance of equipment certainly bears a definite relationship to conservation of material. Proper lubrication of motors and shop machinery will prolong the life of shafts and bearings. Keeping electric motors clean and free from dust contributes to better operation and longer life of the windings. Ninety per cent of all motor failures are due to excessive bearing wear which in time permits contact between the armature and field pieces. Periodical gaging of the air gap will show when bearing renewals are necessary. An example of what such gaging will do will be found in one of our grain elevators where the insurance company insists on this practice and for 10 years we have had no motor failures from armature and field contact.

Electrical control equipment, switch contacts, insulators, etc., if periodically cleaned will function better and longer. We are prone to forget transformers because

they give so little trouble, but if ever they needed care with proper renovation of the cooling oil, now is the time. The Electrical Section of the Association of American Railroads has outlined an excellent procedure of maintenance for motors, controls, and other electrical equipment which, if followed, should prevent expensive failures.

Lubricants are becoming more and more critical. The fats used for making greases may soon be restricted to such an extent that little or none will be available for grease manufacture. Grease can be easily wasted and should be used with judgment, particularly when applied with pressure guns. There is no need in these times to ballast the right of way or plaster the bottom of the running board, the boiler, and the driving-wheel centers of a locomotive with rod grease. The special Diesel oils are already practically unobtainable. What oil is available should be used as long as practicable, and proper laboratory control of the oil in use will logically determine when renewal is necessary. While this may make subsequent reclamation somewhat more difficult, it does not render it impossible.

Tool Steels

The high-speed varieties of tool steel are in the same class with rubber. All railroads have tools and tool steel on their property that they are not aware of. If you have not already done so, a good house-cleaning of all lockers, corners, bench drawers, covered pipe trenches, and similar pits, in fact any ledge or shelf capable of supporting anything, is in order and will undoubtedly uncover a lot of surprising things among which will be a lot of tools and tool steel, some of which will be of the high speed varieties which cannot now be purchased. There is no longer any justification for tools made of solid high-speed steel. If the various types of bit holders are not applicable, suitable large planer and lathe tools can be made by cementing a high-speed cutting edge to a piece of 1045 steel using powdered 1045 steel as cementing agent.

All railroads have tools and tool steel on their property that they are not aware of. If you have not already done so, a good house-cleaning of all lockers, corners, bench drawers, covered pipe trenches, and similar pits, in fact any ledge or shelf capable of supporting anything, is in order and will undoubtedly uncover a lot of tools and tool steel, some of which will be of the high speed varieties which cannot now be purchased.

The conservation of material involves, in addition to proper use, the proper protection and care in handling. It seems unnecessary to touch on this but I'm quite sure all railroads have been guilty of failure properly to protect steel in storage, and have also failed to provide proper storage conditions for other vital materials. It seems we sometimes go out of our way to store rubber goods, tool handles, switch brooms, etc., in nice dry sunny places, and paper containers in damp places. While the engineering or mechanical departments are not primarily responsible they should at least call the matter to the attention of the proper individuals. A somewhat similar situation exists with respect to handling of materials in loading from or loading into cars. While some materials are apparently strong and far from fragile, as for example locomotive tires, they should not be tossed into a pile indiscriminately with resultant nicks which may eventually cause the part to fail in service.

Check Stores Stocks for Obsolete Items

So far the discussion has been purely from the standpoint of the railroads making the best possible use of available materials for the operation of the railroad. It seems to me, however, that we should look beyond the immediate need of the railroads proper. A careful check of material in store stock, particularly steel castings, will show that there are certain items which, because of obsolescence or other reasons, will never be used and cannot be altered to make them usable. Such material is of no earthly use to the railroad and should certainly be released, through sale as scrap, for use in the war effort.

This discussion applies, of course, to all usable material whether new or second-hand. A steel plate which has been used on a bridge or car, but is still in good shape, should be treated in the same manner as a new plate and used with equal economy. Structural steel recovered from dismantled cars can be used in kind for many purposes. Practically all of the large jibs used in our car shop have been made from old center and side sills. Two small gantry cranes and a small transfer table for Diesel locomotive maintenance have been built exclusively from old car sills. While portions of such sills may have suffered from corrosion the balance can be utilized by cutting angles from channels and tees from I-beams.

Scrap Axles as Forging Billets

Scrap car axles can be used for a variety of forgings which permit carbon from 0.35 to 0.50 per cent. Among such items are draft-gear keys and follower plates. Locomotive axles not fit for further use in kind also make excellent forging billets for many purposes. Steel castings have replaced numerous simple forgings for locomotives. The present demand for steel castings for defense practically stops this practice and it will be necessary to return to forgings for many purposes. Engine-truck axles can be forged down to round bars for use as piston rods, wrist pins, small crank pins, crank-pin collars, etc.

This may appear to some to be questionable practice. However, all axles should be checked with the Magnaflux for cracks before attempting further use, and cracked portions cropped off. Furthermore, the heating and working disclose defects which may be missed by the Magnaflux. It appears far better to use a part carefully made from a second-hand axle than to keep a locomotive or car out of service for want of an important forging.

The Kaleidoscope of Material Substitution

Finding substitutes for substitutes demands constant exercise of ingenuity — Many materials affected

By C. B. Bryant

Engineer of Tests, Southern, Alexandria, Va.

During the past ten years, railroads have been substituting economical materials and operations for more costly materials and operations, and have been making a good job of it. In this new day of changed operating conditions many of the old rules of practice must be revised. Instead of "can we afford it" or "how much will it save," we are now learning to substitute "is it available" and "can it be made to fulfill the function of what we have been using." We are still substituting for what we do not have—during the thirties we were substituting for money, now we are substituting for materials.

Railroading is fundamentally an operating industry, using materials and equipment, with which we must live for many years after we have acquired them. For the manufacturer, once a change is decided on and the shift in production is made, the problem is largely settled. In railroading, however, the answers to design and manufacturing problems must first be found, and then the maintenance and operation problems must also be solved.

Substitutes Are Being Found

No one person or organization can, or is attempting to claim credit for complete originality and independent thought in this work. On the contrary, the progress we have made and are expecting to make in the near future is built on a splendid cooperation between different individuals and different organizations and the development of constructive suggestions and ideas received from any source. Much of this information is already available in the minutes of various committee meetings and new standards of materials and designs adopted by the A. A. R., A. S. T. M. and War Production Board technical committees. Consequently, what I tell you is really only a summary of the actions given from my point of view. I shall not attempt to limit the items mentioned to those falling within the mechanical field of railroad operations but shall cover operations in general.

How Scarce Is Copper?

Last December, when the impact of actual war first struck us, we had already the advance knowledge that many materials were going to be scarce. Aluminum and some other metals had already disappeared from railroad uses but such uses were relatively minor and the full realization of what we were facing in the way of substitution had not yet developed. The first scarcity which hit home to railroad operations was that of copper on which railroads depend for many important operations, although the total tonnage consumed is not large. The necessity of not only reducing our purchases of copper and copper alloys but the probable necessity of releasing large quantities of copper alloys already in service on the American railroads to other industries was the first great problem which the railroads faced.

The largest single item of copper used by the railroads is in car journal bearings, of which there are an estimated 20 million in service, containing in round figures 170,000 tons of copper. These bearings when worn out are not destroyed but are remelted and remanufactured to an estimated extent of about 25 per cent of the total number each year. If while performing such remelting and remanufacturing we could release copper to other users or if we could reduce or eliminate our requirements for make-up material to replace that actually worn away in service and lost in foundry operations, we would then be contributing to relieving the shortage of copper to that extent. We were told by the War Production Board that, while the total amount of new copper to be made available in 1942 would be approximately 45 per cent more than in 1941, the increased essential demands for military uses only would require all of the production increase and also a considerable proportion that would otherwise go into ordinary civilian uses.

New Bearing Designs

During January of this year the A. A. R. adopted new compositions for the bronze backs of car journal bearings, reducing the maximum copper content permissible by approximately eight per cent. There was also adopted a revised and lightened design for bearings, resulting in the saving of approximately five per cent of the amount of bronze used per bearing. At that time a new Committee on Journal Bearing Development was set up which immediately instituted an extensive research program looking toward further reduction in use of critical metals. This committee has been functioning in an extremely energetic way and during May, as the result of the research work which it had been conducting, it offered a further modification in journal bearing design resulting in the saving of an additional 12 per cent of bronze. There are many possibilities of further savings not only in further changes in design but in the substitution of other metals in whole or in part for bronze. I am hopeful that within the next few months there may be other similarly constructive actions derived from this work.

The entire field of railroad uses of copper and copper alloys has been studied and restudied. In shoes and wedges for locomotive driving boxes, malleable-iron faced with bronze bearing surfaces can be substituted for the solid bronze castings heretofore used. This substitution will not result in any ultimate reduction in the use of bronze but it will make available for other necessary uses a considerable tonnage of bronze now in service. Grey iron bushings can be substituted for bronze in certain classes of power with probability of shorter life and increased cost but with the necessary saving of non-ferrous metal. Economical long-life copper pipe and tubing is being replaced with steel and wrought iron.

In the field of locomotive driving-axle bearings substitution of higher lead content bronzes for those now being used is made possible by casting such bearings in metal or "chill" molds instead of sand molds with resultant reduction in quantity of tin and copper requirements.

With respect to air-brake parts a special A. A. R. committee appointed to study that subject has reported the possibility of replacing 34 per cent of the brass now being used by other non-critical metals.

Substituting for Tin

When the great bulk of the world's tin supply coming from the Far East was cut off, the tin situation suddenly became even more critical than the copper. The first action taken to meet this situation was a revision in A. A. R. requirements for soft-babbitt journal-bearing lining metal, in which tin constituted about 4½ per cent, by which the tin content was reduced to a maximum of 3 per cent. The thickness of the journal-bearing lining metal was reduced first from ¼ in. to 3/16 in. and subsequently in May again reduced to ⅛ in., the changes in design and composition together accomplishing a saving in tin approximately 75 per cent of the amount previously used. It is not easy to make such sweeping changes as these and they must, of course, be made only with the certainty that railroad operation will not be rendered unsafe or undependable. These changes and others to be mentioned later have not been made with any idea that they will result in operating economy. In some cases we know that costs may be materially increased. They have been adopted as a means of carrying us through the period of war scarcities when it is and will continue to be impossible to secure materials to operate on the same basis as previously.

Other types of tin-bearing metals have also been affected by the tin situation. Recent W. P. B. orders have placed severe restrictions on the percentage of tin that can be used in all such mixtures and this action has intensified the interest of users in various low-tin specialty mixtures that have been developed for bearing metals. Some of these substitutes have been used sufficiently to warrant greater attention. An alloy consisting of 98 per cent lead hardened with calcium and about one per cent tin has been widely and successfully used in Diesel-engine bearings and to some extent in railroad car journal bearings. Its use in interchange freight car service has been approved by the A. A. R. Another specialty bearing metal consists of less than one per cent tin with antimony and arsenic as hardeners in a lead base. This alloy is being investigated in connection with its possible use in car journal bearings but the results are not yet available.

In the field of solder, tin is being replaced by other metals, including silver. Tests which have been made on my own railroad show good possibilities for such solders but indicate the necessity for material revision in shop practices in order to use them.

Alloy Steels Affected

Railroads have not been large users of alloy-steel forgings but a considerable number of locomotives are now operating which were designed around certain alloy steels. With the gradual and now virtually complete disappearance of alloys from railroad uses, including nickel, chromium, vanadium and the probable elimination of molybdenum, together with the necessity for sharply reducing manganese use, the problem of maintaining these alloy-steel locomotives has become acute and difficult. The substitution of carbon steel for nickel-alloy boiler plates in locomotives designed for the latter necessitates reduction in working pressures, increase in weight, or both, with consequent reduced transportation efficiency for such units. Locomotives designed with light-weight alloy-steel reciprocating parts require extensive rebuilding when heavier carbon steel parts of equivalent strength are substituted.

In such cases, restrictions in maximum permissible speeds are necessary. Intensive studies are being made looking toward the possible substitution of quenched and tempered carbon-steel forgings for alloy steel and preliminary experience of those roads which are facing this problem indicates that the reduced efficiency and capacity of the locomotives may not be as serious as was first feared. Fortunately, this difficult situation does not apply generally to the great bulk of steam locomotives now in service on the American railroads but it is nevertheless a very serious situation for those railroads that operate the engines in question and, in view of the present extreme demands for power, it is serious to the railroad transportation picture as a whole.

In certain classes of carbon-steel forgings, particularly those subject to high stresses, it has been necessary to use aluminum as a deoxidizer in making the steel in order to produce the fine-grained micro-structure considered essential for this class of service. Aluminum has not been available for this use and so far no satisfactory and available substitute has been found. This situation is receiving intensive study. Information just received from the W. P. B. states that it will probably be able to authorize sufficient aluminum for this purpose.

No one person or organization can, or is attempting to claim credit for complete originality and independent thought in this work. On the contrary, the progress we have made and are expecting to make in the near future is built on a splendid co-operation between different individuals and different organizations and the development of constructive suggestions and ideas received from any source. Much of this information is already available in the minutes of various committee meetings and new standards of materials and designs adopted by the A. A. R., A. S. T. M., and War Production Board technical committees.

Bessemer Replaces Open Hearth

In the field of freight-car construction Bessemer steel has been accepted as a substitute for open-hearth steel in certain car structural parts and to this extent the productive capacity of open-hearth steel has been released for military uses. Under the allocation plan of the War Production Board certain steel mills are operating almost entirely on a basis of specifications for ship-building plates and in many instances plates to that specification have been used in car construction instead of the usual

structural grades of steel. We do not anticipate any disadvantages in service because of these substitutions.

In both mechanical and maintenance-of-way equipment the growing utilization of welding as a substitute for the replacement of worn parts has been greatly stimulated and expanded, although we may reach a limit to which these operations can be used because of the necessary alloying constituents of the welding electrodes and rods.

Rubber

The next great scarcity which faced us was that of rubber, with which everyone is already familiar. Railroads are large users of rubber hose and the Mechanical Division of the A. A. R. has agreed upon a series of emergency rubber-hose specifications which will materially help conserve the dwindling stock pile of crude rubber which was on hand in this country at the time of the fall of Singapore. These changes largely contemplate the substitution of new rubber by reclaimed rubber. They result in inferior hose with anticipated life probably less than half that we have been securing in the past.

It is hardly necessary to mention the care with which such changes must be considered, particularly in certain grades of hose, such as air-brake hose, where failure is likely to result in serious accidents. We believe we have adequately safeguarded this phase of the matter and that the substitute hose will be no more likely to sudden failure than that previously manufactured. These modifications in rubber are not only uneconomical at the present but will doubtless ultimately result in increased demands for rubber due to the shortened life of the emergency products. The changes have been made necessary notwithstanding these disadvantages because of the absolute necessity of continuing operations until such time as synthetic substitutes for rubber may be available to us several years hence.

We are studying the use of spliced short lengths of worn-out hose to build up long sections where normally new hose would be provided and we also are considering the use of flexible metallic connectors of various types for certain applications where rubber hose is more desirable.

Railroads use rubber in a large variety of miscellaneous applications, all of which were carefully studied by a special committee on rubber conservation appointed by the A. A. R. at the beginning of the war. Last January this committee issued its first recommendation, which listed 66 specific applications of rubber for which other materials can be substituted and made definite recommendations for the material to be used in the replacement of each item. For 40 other items no definite substitute could be immediately suggested and intensive study is being given these in cooperation with manufacturers with the expectation that in many cases the rubber can be eliminated or its use greatly reduced.

Changing Paint Specifications

In the field of paints the railroad specification writer has faced the necessity of making changes in formulations which have been developed in the past, because certain materials are no longer available. Outstanding among these is China-wood oil, a most valuable ingredient for manufacturing high-grade freight-car finishes. China-wood oil possesses certain properties of pigment suspension, drying characterstics, water resistance and durability, which, in spite of its high cost, justify its use. With the stopping of imports of this oil from China and the freezing of stocks already on hand for military uses, some substitution of available material had to be made. The most logical substitute, Perilla oil, is unfortunately equally scarce. Specially processed dehydrated castor oil can be manipulated so as to be a fair substitute for the China-wood oil and it is apparently available in adequate quantities to take the load.

In the case of paint vehicles known as alkyds which comprise a whole family of synthetic resins, one of the basic raw materials is the compound phthallic anhydride. While the alkyd vehicles are yet relatively new in exterior finishes, they have been making rapid progress and show much promise. They have been used to some extent in freight-car finishes. Some months ago the government placed orders for another derivative of phthallic anhydride, in connection with explosive manufacture, which absorbed the entire productive capacity of the country for a long period, thus making it impossible for industrial users of alkyd paints and enamels to extend the use of these materials as a substitute for the China-wood oil finishes. In the field of other synthetic resins, such as the phenolic type, also much used in high-grade finishes, government requirements in connection with explosive production have also absorbed much of the basic raw materials. Here was a situation where several of the most dependable substitutes were unavailable and much work had to be done in order to locate other substitutes which would not be too inferior and which could be obtained.

In the field of paint pigments, similar scarcities developed. One of the desirable combinations of pigments for priming paints on steel surfaces involves the use of zinc chromate. With the loss of the Philippines and the cutting off of much of our supply of chromium ore, the production of zinc chromate pigments has been affected and, while they are still available in small quantities, it seems likely that we shall have to divert our uses to other materials. This problem is not fully solved as yet.

Greases

One of the soft lubricating greases extensively employed in locomotive lubrication has in the past been rendered adhesive so as to avoid being thrown out of revolving parts or forced out of loosely fitting bearings by the use of rubber latex or of a petroleum derivative having rubber-like properties. The rubber latex for this purpose is no longer available and the petroleum derivative has been largely withdrawn from grease manufacture presumably because it can be diverted into synthetic rubber production. Work is under way at the present time in an effort to retain the desirable properties of such greases without resorting to these two no-longer-available materials.

Fewer and Poorer Brushes

Railroads are very large users of brushes for paint and varnish application, as well as for many other uses. Bristle for brush manufacture is hog hair and unfortunately the breeds of hogs raised in the United States do not grow bristle. The world's supply has come from other countries, predominantly in the Orient, including Siberia and China. The Russian bristle disappeared from the market some years ago and for the past few years the Chinese supply has been the one on which the entire brush industry depended. Bristle is a high priced commodity and even after the Japanese had closed the Chinese seaports, bristle still came out of China in fair volume over the Burma Road. Even that supply has not been available for some months and the brush industry is literally living on its fat and is depending on the stocks of bristle already on hand.

The War Production Board recognized the urgency of this situation during February, 1942, by issuing an order

requiring the use of some substitute or adulterant in all brushes to the extent of 45 per cent of the total normal bristle content of the brush. Horsehair has been substituted generally but the blended horsehair and bristle brushes will not give good performance or long life as compared with the pure bristle brushes. There are many places where spray painting can be substituted for brush painting and this is particularly true on freight cars and in maintenance painting of structural steel. For many applications, however, only brushes are practical and we must get along the best we can.

The production of synthetic bristles has not yet reached the point where satisfactory paint-brush bristles can be made, as the synthetic bristles do not have the same characteristics of tapered structure and paint carrying properties as the natural bristle. For stiff brushes, such as scrub brushes, tooth brushes, hair brushes, etc., the synthetic bristles are entirely satisfactory. We are hopeful that means will be found soon by which synthetic bristles suitable for paint brushes can be produced.

Substitutions and Safety

One of the constituents in the burning composition of a railroad fusee is potassium perchlorate, which, unfortunately for us, is also one of the major constituents in certain types of aerial flares necessary for use by our air forces. A considerable part of our potassium perchlorate has been imported in the past, much of it from Japan, and the domestic production is wholly inadequate to satisfy the requirements of the existing civilian plus the new military demands. We have been forced to reformulate the composition of our fusees to meet this situation by the substitution of other available compounds for the potassium perchlorate and fortunately we have been successful in this, although the new formula fusees are much inferior to the old.

The use of railroad electric hand lanterns for signaling in train operation instead of the familiar kerosene lantern has been growing rapidly in recent years and several states have enacted laws making it mandatory to use electric lanterns for this purpose. Two of the principal ingredients in the dry cell batteries for these lanterns are zinc and manganese dioxide, both of which are on the critical list of materials. The battery manufacturers are extremely alert to this situation and are making the utmost efforts to continue to produce such batteries in adequate quantities, although their mixtures have been altered from those formerly used. One proposal which we are actively investigating at the present time is a newly designed rechargeable storage battery built on the same principle as the battery in your car. In using such a battery it is kept in a charging device when not in actual service in order to keep it in operating condition. We do not know how this development will work out. The batteries themselves are very expensive, a recharging device must be purchased for every point where batteries are used, and men must be trained to utilize such devices intelligently.

I give you these details so as to acquaint you with a few of the situations with respect to material substitutions that are facing American railroads. Some of these have already been solved at least to a workable extent, others still require research and testing before a solution can be reached. We on the railroads who are immediately concerned with many of these problems are working hard on them and shall continue to do so. The necessities are great and I am certain our efforts to solve these problems will be equal to the occasion.

The Reclamation Plant—A Dependable Source of Material

Processing of scrap offers opportunities for the railroads to help themselves and the nation at war

By G. A. Goerner

General Storekeeper, Chicago, Burlington & Quincy, Chicago

WEBSTER defines reclamation as the act of making industrial waste products useful. It is not necessary to bring the material back to its original condition. It is only necessary to make the waste product useful. It may be reworked, reshaped or converted into something entirely foreign to its original service. So long as there has been a profitable or advantageous conversion of the scrap item, the process is reclamation. Many items of material are restored to their original state of usefulness. Other work is performed so that the material will serve much better and longer than when it was new.

This may sound fantastic but it is true. At no place are defects in materials, weak spots in design and places of unusual wear more easily detected than at central scrap docks. Here, all car couplers that have been sent in as scrap are segregated to determine if they can be reclaimed. This grouping often discloses a uniform type of break which can be repaired by welding. Items will also be found where the original wearing surface may be built up with welding material to produce a product far superior to the item in its original form. When instances like these are discovered, action is taken to correct this condition on future new material, and the economy in labor and maintenance in not having to replace such parts when they wear out may be even greater than the saving in replacement material.

When is Reclamation Repair?

It is difficult to differentiate between reclamation and repair. A considerable portion of the work done at railroad reclamation plants is repair work, and some reclamation is performed in roundhouses and shops. However, it is not so important to draw the line between repairs and reclamation as it is to emphasize the importance, at a time such as this, of doing all that can be done to save the manufacture and use of new materials.

The net saving from reclamation on one railroad alone during the last calendar year was nearly one-half million dollars. This was the accomplishment of the reclamation plant only. It does not cover any materials repaired or manufactured at shops, roundhouses or at any other place on the railroad. In addition, there was manufactured at the reclamation plant from scrap, material valued at $65,000 at a net saving of $27,000. These savings

represent the difference between the scrap value of the material plus the cost of reclaiming, including all overhead, such as supplies, electric current and stationery, and what it would have cost if the material had been purchased. Since no material at this plant is reclaimed except on orders from the general store, it would have been necessary to purchase new all the items if they had not been reclaimed or manufactured. The total scrap utilized in this manner amounted to nearly 10,000,000 lb., or 5,000 net tons.

Cost Factors Less Important Now

While, under normal conditions, no reclamation or repairs to material should be made unless there is a saving to the railroad, there are occasions which justify an expenditure equal to, or even greater than, the cost of the new material. Today reclamation has become a national necessity. It is no longer only a matter of economy, but a matter of conservation. In self-preservation, the railroads must reclaim material that is difficult to replace. The reclamation of old materials, moreover, saves new and raw products for defense purposes and is, therefore, a patriotic duty in the interest of defense.

Burlington Reclamation Work Centralized

Usually that which is everybody's business receives no special attention. Reclamation should, therefore, be handled as a specialty and studied as such. It will suffer from lack of attention unless it is made the particular business of one man who will head that work. The Burlington inaugurated the office of superintendent of reclamation and scrap 16 years ago. Most other large railroads also have specialty men for this work. Unless there is such specialization, there is the danger of reclaiming material that is not needed and of discarding material as scrap which should be reclaimed. There will also be a lack of uniformity in the work that is done and perhaps no check on the costs to determine its economy.

Centralized plants provide the best means for efficient reclamation. It is the best arrangement from a material-handling and shipping standpoint. Where the reclamation plant is located at a point other than the scrap dock, considerable material must be reshipped. Much material that is reclaimed is picked or sorted out of scrap. There is better control of this, and less opportunity of permitting reclaimable material to be sold as scrap, if the reclamation supervisors are located where they can see the scrap as it is sorted.

Centralized reclamation provides other advantages. Where reclamation is handled at a number of shops or roundhouses, there is not sufficient volume at any one point to justify the purchase of special equipment for doing the work. As an example, where all angle cocks for a large railroad are reclaimed at one point, a multiple grinder will greatly reduce the cost of doing the work. Thus, one man can grind six or more valves at a time. If scrap air or signal hose are dismantled at a number of points on the railroad, there is not enough of this work to justify special equipment for the dismantling, but when the work is centralized, modern equipment will pay for itself in a short time. There is also a better opportunity for specialization which leads to more effective work because of having more of one type of work to do. Thus, one man may become a specialist in reclaiming switch stands, another, brake beams and still another in welding car bolsters. It is not only a matter of knowing how to weld but knowing what may be welded under existing rules.

From a distribution standpoint, centralized reclamation is of special benefit. Where material is reclaimed at a dozen places on the railroad, much of it is not located at the point where it will be needed. If it must be shipped to some other point, it is likely to move in light carloads. When the work is centralized, especially if the reclamation plant is near the general store, the volume of material handling is sufficient to ship it in carload lots to most large stores or in joint carloads to the smaller stores.

Finally, centralized reclamation provides the best stock control for the material to be reclaimed. Material should not be repaired or reclaimed simply because it is reclaimable. It should be reconditioned only because it is needed for the operation of the railroad. Otherwise there is no economy in reclamation. If the reclaimed article is not going to be used, it had better be scrapped before added labor and material are spent to reclaim it. But that does not imply that reclaimable material should be scrapped because there is no order for it. On the contrary, if it will be used in reasonable time, it should be carefully stored at the reclamation plant until it is needed for stock or for use. The very fact that reclaimable material is on hand and may be reconditioned when needed for use, or for stock, permits operating on a smaller stock, for the control of supply is entirely in the hands of the railroad.

Many reclaimable items are worth nearly as much as new materials because the cost to reclaim them represents but a small per cent of the original cost. Therefore, it is as important to prevent damage to them or to avoid their loss as it was when they were new. Delicate items should be crated or boxed when shipped in the same manner that they were cared for when new. Where skids are used for transporting material between stores and the reclamation plant, much of the packing may be avoided, for the skid may provide ample protection. Reclamation by welding can only be carried out to the fullest advantage if parts of broken castings are kept together so that they will arrive at the plant at the same time. This may be accomplished by wiring them together or preparing them for shipment in a special way to bring about such results. The difference between treating old material as so much scrap or handling that which is reclaimable with proper care, on a large railroad, represents a loss or gain of many thousands of dollars. Especially at a time like this when material is at a premium, it is of utmost importance that every effort be made to preserve it.

Where Reclamation Begins

Each railroad should make a careful study to determine how much of its material may be salvaged and reused. It requires a special study of each commodity, or even of each item, because conditions on the railroad, the quantity of an item used, the source of supply and many other matters may have a decided bearing on the advisability of reclamation. An educational campaign should be conducted to train foremen or specialty men at roundhouses and shop points, as well as at all other points where material is released, to inspect the material and determine whether it really should be scrapped. Possibly it should remain in service longer; perhaps a minor adjustment is all that is needed. The best way to take care of a leak is to fix the faucet. Thus, the economy must be most effective where the material is used. It is there that any waste must be checked. In addition, a careful check should be made at the central scrap dock. Material fit for re-use and that which may be reclaimed, repaired or converted for other uses should be salvaged. Reclamation men should seek and receive the full co-operation of specialists of other departments in carrying out this work to the limits of its possibilities.

Approved Practices

A complete list of reclaimable material would be needlessly long but some of the newer ideas and methods should be mentioned.

Bolts for cars can be sorted to size, cut back, where rethreading is not desirable, and rethreaded. Engine bolts can be cut to shorter lengths or turned to smaller sizes. Much round iron and steel, scrap brake-beam rods and the like, arriving at the scrap dock, can be used for manufacturing machine bolts. Stay bolts can be rattled to remove the lime and re-used to make engine bolts or hammered into slabs for locomotive forgings. Crown stays can be annealed and reworked for stay bolts of shorter lengths.

Nuts can be sorted to size and retapped. Grip nuts can be reclaimed by giving them a sulphuric acid bath to cut off the rust, then placing them in caustic soda to stop further action of the acid. They should then be run over a revolving brush to clean the threads.

Tinware should be utilized to the best advantage by repairing. Care must be taken to prevent further damage in shipment to repair plants. An engineer's oiler that needs only the spout welded or a leak repaired may be so damaged in shipment with other scrap as to render it useless. Empty carbide cans can be converted into "dope" buckets or waste baskets. Empty paint pails can be cleaned and used for "dope" buckets and for many other purposes where cans are needed.

Worn Pipe Fittings Good for Temporary Jobs

While valves and unions are usually removed because of leaks, other pipe fittings are removed because of changes in pipe lines. All pipe and fittings removed from service should be inspected carefully and salvaged where practicable. Fittings that have been weakened because of corrosion or wear can be placed in unimportant services where little pressure is used. They can also be used for temporary jobs where they need serve only a short time. In such cases, the material should be so marked that it will not be used for important, high-pressure work. All fittings should be removed from pipe and inspected to determine their further value. Threads should be cleaned thoroughly with a fine wire brush before returning them to stock. It may be necessary to chase some threads with a hand tool or pipe tap. Where a tap is used, it should be used for cleaning the threads and not for additional tapping. Some odd size fittings can be retapped for larger pipe. Many valves that find their way to reclamation plants need only cleaning and regrinding. Usable parts from valves that must be scrapped should be salvaged and used for repairs to other valves. Often pipe turned back as scrap is fit for further service except that the threads are battered or worn. Such pipe should be cleaned, cut back and rethreaded. Shorter pieces will do for nipples.

While, under normal conditions, no reclamation or repairs to material should be made unless there is a saving to the railroad, there are occasions which justify an expenditure equal to, or even greater than, the cost of the new material. Today, reclamation has become a national necessity. It is no longer only a matter of economy, but a matter of conservation. In self-preservation, the railroads must reclaim material that is difficult to replace. The reclamation of old materials, moreover, saves new and raw products for defense purposes and is, therefore, a patriotic duty in the interest of defense.

Coil and elliptic springs can be retempered and brought back to their original set. Broken leaves of elliptic springs should, of course, be replaced. Proper facilities for testing springs should be provided so there will be no question about their service after they are reconditioned. The steel from scrap springs offers many opportunities for the manufacture of specialties. "S" wrenches, double or single end, can be made from elliptic springs. Nail-pulling bars, stone chisels and many similar items can be made from scrap coil springs. Scrap brake-cylinder springs provide good material for the manufacture of journal-box packing hooks and irons.

Few items of scrap offer so many profitable outlets as scrap boiler flues. They can be used for the manufacture of locomotive pilots, farm gates, snow-fence stakes, sign posts, fence posts and jetties. Scrap dealers are always in search for them.

Driving axles can be reworked into piston rods and other forgings. Car axles can be reclaimed by building up collars of journals or by converting them into axles with other size journals. Piston rods can be turned down for use on lighter power or, if worn to the limit, can be used for making shafts for roadway machinery. Repairing brake beams by using second-hand parts, some of which may be reclaimed by welding, is profitable.

A. A. R. rules must be followed in reclaiming railway material, but today there are a number of items that ought to be considered so as to extend the use of material where this can be done with safety. With modern welding methods there are few castings and forgings that cannot be reclaimed by welding to repair broken or cracked places or to build up worn places.

Few commodities can be reworked for so many and varied uses as second-hand lumber. For large timbers removed from bridges and buildings, a resaw plant is advisable. At such plants the timbers can be sawed to smaller sizes for building work, for car stakes and for the manufacture of other wood products. Car siding, which cannot be re-used as such, can be used for the manufacture of grain and coal doors. Finally, second-hand lumber can be used as patch lumber for coal cars or cut to suitable sizes for use as blocking in freight houses and cars.

The Purchases and Stores section of the A. A. R. has worked diligently on this subject for years and has made hundreds of recommendations of methods by which items may be reclaimed profitably. These recommenda-

tions cover ways of salvaging everything from paper to locomotive forgings, from rubber to rail. In spite of all the progress which has been made, however, hundreds of profitable ideas on material reclamation still lie dormant or hidden from view, and the needs of the present make it highly important that they should be brought to light.

Discussion

Following the presentation of papers at both the morning and the afternoon session, several persons took part in a general discussion which dealt with all of the subjects.

In throwing the meeting open for discussion Mr. Ellis commented on the need for careful servicing of shop machinery, particularly with respect to lubrication. Tools which have been worked from four to eight hours a day, he said, might soon be called upon for 24 hours daily.

Speaking specifically to the manufacturers of railway supplies and equipment, he asked that they assign their salesmen, with their special knowledge and engineering ability, to the task of helping the railroads to conserve the materials or equipment with which they are familiar and assist them in keeping it patched up, if necessary.

Mr. Ellis expressed the hope that the mechanical engineers present at the meeting had received sufficient encouragement and inspiration from what they had heard at the meeting that they would go home ready to exercise their initiative, and that the mechanical and other officers in attendance had gotten enough out the meetings so that they would go home and turn their engineers loose in fields in which they had never dreamed of putting them before.

E. S. Pearce, president of the Railway Service and Supply Corporation, Indianapolis, Ind., commented on the journal bearing research program of the Mechanical Division of the A. A. R., to which Mr. Bryant referred in his paper on substitutions of materials. He attributed the dispatch with which the work was gotten under way by the railroads to the fact that laboratory facilities and trained personnel were already available, as well as the accumulated experience of 10 years of private research along similar lines.

Analyzing the problem which faced the special journal-box research committee of the Mechanical Division, Mr. Pearce named three alternative courses which it could pursue in carrying out its objective to save copper. These were, first the immediate possibility for conservation by reducing the physical dimensions of the standard journal bearing. Some of these changes not only reduced the weight but, he said, were known to increase the service life considerably. By the employment of proper practices in the manufacture and use of the bearing the causes of defects and failures could be eliminated or controlled, thereby reducing the relatively large bearing turnover.

The second alternative was to reduce to a minimum the use of copper alloys by a combination of substitution and design modification. The third, he said, was the elimination of copper alloys by complete substitution.

Mr. Pearce reviewed step by step the developments in the research program up to the present time, in the first several steps of which a reduction of about four pounds in the weight of the bearing has been effected. The next step, he said, is a bearing which is now under service test which reduces the bronze content of the bearing from the standard 25.25 lb. to 8.75 lb. in a 5½-in. by 10-in. size. This consists essentially of a malleable-iron adapter, matching in shape and dimensions the present bearing in which the light-weight alloy bearing is inserted. He pointed out that if all the estimated 14 million bearings in service were to be fitted with these substitute bearings, assuming that they average 5½ in. by 10 in. in size, the aggregate tonnage of non-ferrous metals which could be diverted to other uses would be: copper, 84,000 tons; lead 25,000 tons; tin, 6,000 tons; antimony, 3,000 tons.

John R. Jackson, engineer of tests, Missouri Pacific, who is also a member of the special A. A. R. committee which has in charge the journal bearing research, said that the committee is now undertaking the more difficult part of its assignment in studying the thermal conductivity and deformation of non-conventional design and materials under full loads at a top speed of 100 m. p. h. Mr. Jackson pointed out the difficulties of making major changes in bearings. Radical changes, he said, are impractical unless, as in the case of roller bearings, the present assembly is replaced with an entirely new design.

Guy O. Beale, chief purchasing and stores officer of the Chesapeake & Ohio, the Nickel Plate, and the Pere Marquette, commented on the relations between the increased requirement of materials and the efforts of the railroads to bring down their stores inventories as required under Priority Order P-88. He said that because of the amount of material reclaimed, the consumption of the stores stock on many items had been so much reduced that the rate at which inventories of these items are being reduced has been materially slowed up. Since Priority Order P-88 went into effect, he said, the railroads have been able to get along with a smaller inventory because of the improved priority assistance which has become effective under that order. He said that if the three railroads with which he is connected can do as well within the next 12 months as they have during the past few months, there will be nothing to fear.

K. F. Nystrom, mechanical assistant to the chief operating officer, Chicago, Milwaukee, St. Paul & Pacific, spoke of the success with which steam railroads have reduced the number of unserviceable locomotives to considerably less than eight—even less than five—per cent in some cases, and the per cent of bad-order freight cars to an average of around 4½. He emphasized the important effect on the power supply during the coming months if it were possible to bring the unserviceable locomotives generally down to less than 10 per cent. From his own experience he expressed the definite opinion that it would be possible to reduce bad order freight cars to less than 1½ per cent.

D. A. Steel, purchases and stores editor, Railway Age, commenting on Mr. Goerner's paper, suggested that the handling of scrap and reclamation at central plants must depend to some extent upon circumstances because some railroads never have had the centralized plants and others who formerly had them discontinued their operation during the depression. He thought that in this case the railroads would have to carry on their operations at the various shop points. He also suggested the desirability of developing objectives of some sort to serve as stimuli in the field of reclamation.

In his closure Mr. Goerner reiterated his belief that the centralized reclamation plant gives the best results, but made it clear that each case must be studied and the type of operation determined on the basis of the specific circumstances involved. He also brought out that on the Burlington no new items of reclamation are added without first referring the process of reclamation and the results to the engineer of tests for his approval both of the method proposed as well as of the product.

EDITORIALS

Keep the Cars Moving

Some extremely pertinent information regarding the inspection and repairing of freight cars is included in a committee report presented at the annual meeting of the American Association of Railroad Superintendents held at Chicago in May. According to this report, the average freight car makes a repair track movement on the average of about once every sixty days, which is surprisingly often and a real source of car delay. It is obvious that during the present emergency when maximum car utilization is imperative, some means must be found to reduce the frequency of these visits to repair tracks and also minimize the time required for actual repair operations so that the cars can be returned to service with no more delay than absolutely necessary.

New cars in general embody improved engineering designs and materials well adapted to stand ordinary usage over a long period and any failure to utilize quality materials in car construction is false economy. Since a large percentage of car detentions are caused by truck failures, including wheel defects, broken brake hangers, etc., the necessity of giving particular attention to these parts at interchange inspection points is, of course, apparent. The A.A.R. Mechanical Division has issued instructions which cover this, as well as other details of car inspection and maintenance and careful following of the instructions given and rules laid down will go far to improve freight-car conditions and promote a higher degree of car utilization.

The hot box is, as always, a prolific source of car delays and the superintendents claim quite naturally, and in some cases no doubt accurately, that the average car inspector attributes waste grabs and attendant hot boxes to rough switching and rough track when often the real cause is packing placed too high in the journal box, use of inferior reclaimed waste, or oil. A.A.R. Rule 66 has probably made as great a contribution to improved journal-box conditions and the reduction of hot boxes as any other single factor and there is still some work to be done in securing more general and all-inclusive adherence to this rule.

Other points, strongly emphasized in the superintendent's report were the need for prompt handling of cars at wheel tracks and cleaning tracks, due attention to the material situation to make sure that cars are not delayed by lack of necessary repair parts and the education of car inspectors and repairmen with periodic checks of their physical condition, including vision. Special efforts should be made to encourage and develop good judgment in car inspectors and skilled, careful workmanship in car-repair forces, so that cars will be sent to the repair track only when absolutely necessary and then receive expeditious and adequate repairs which will permit them to give another reasonable period of satisfactory service before requiring further mechanical attention.

The inspection of trains and cars is a 24-hr. job which requires, among other things, the best of lighting facilities to discover hidden defects and it is sometimes advisable to work two shifts of car repairers, with the night shift to look after loads principally. These combination car-repair men and inspectors can be used to augment the inspection force when necessary and thus help keep the cars moving.

A Challenge of Total War

"There was a time when I knew that certain items that we were not getting were going to industries that I thought were not very essential. At that time we never let up for an instant in trying to get even more than the railroads had asked for. But we know now where these materials are going and we know especially in the railroad items how directly competitive they are with military necessities both in army and navy equipment."

Thus, in his address at the railroad sessions of the American Society of Mechanical Engineers at Cleveland on June 10, did Andrew Stevenson, chief, Transportation Equipment Branch, War Production Board, state the reason why the railroad industry has been disappointed in the number of new cars and new locomotives it has been able to secure during 1942.

The statement that this is a total war has been reiterated so many times that it is becoming trite, and yet its full significance is only beginning to be apparent. In a total war production and internal transportation are as much a part of the war effort as the military operations in the field.

Mr. Stevenson pointed out the similarity in the character of the products needed by the railroads and those in demand for the production of army and navy equipment. He might well have included also merchant shipping, for more and more of which we are

now in desperate need to insure the success of our entire war effort.

Great risks have to be taken in the prosecution of a war. High factors of safety are seldom assured in the conduct of military operations. It is only a normal risk of war, therefore, if the railroads have to face their part of the national wartime task with fewer new cars and new locomotives than are needed to maintain the customary factor of transportation safety during the prospective fall traffic peak. Certainly, the factor of safety in shipping at the present time is far worse than that of the railroads.

This is a challenge of total war to which railway men can and will rise.

Is the Risk A Reasonable One?

It is evident that as the year advances the customary factor of safety with respect to freight motive power, as measured by the highest past statistical average intensity of the motive-power utilization, is going to be considerably reduced. One convincing evidence of this lies in the fact that during the month of March—the latest for which the data are available, freight-locomotive mileage of the Class I railroads had already exceeded that of last October by one per cent, and the average freight locomotive-miles per day of 24 railroads exceeded 100 miles, while in October only 20 railroads were in the 100 miles or better, group.

What are the prospects that the present motive-power supply will be able to measure up to the higher utilization rates required next Fall?

In considering this question it is well to take into account certain aspects of the history of the steam locomotive. One need go back but little more than 25 years to reach a period when the steam locomotive was not considered capable of running more than 100 to 125 miles without complete servicing, and repairs such as rolling in flues or one or more jobs on the motion work or running gear. Then certain railroad men with more than the average faith in the capacity of the steam locomotive for better things risked their jobs in demonstrating that it was only well warmed up to its work at the end of 100 to 125 miles. Going a few years further back, the locomotive was hardly expected to run non-stop more than 25 to 50 miles between ministrations of the engineman and his long-spout oil can.

Despite the fact that, today, these limitations have all been greatly extended by the development of mechanical lubrication, by the improvement in water conditions and boiler construction, by mechanical improvements, and by systematic attention to running repairs at monthly inspection periods, the steam locomotive is still to a very considerable extent the victim of its early history. That this is true is indicated by the results of a number of endurance tests to which freight locomotives were subjected some twelve to fifteen years ago.

On August 13, 1929, Engine No. 4113, a Mikado type freight locomotive on the St. Louis-San Francisco, completed a 25-day period of continuous service without dropping the fire. The locomotive was under steam continuously for 587 hours, during which time it made 7,350 miles. A year later, on the same railroad, another freight locomotive, operating in the same territory, between Kansas City, Kan., and Birmingham, Ala., was under steam continuously for a complete 30-day period, during which time it made 9,700 miles.

These tests developed no phenomenal mileage—the average during both was not far from 300 miles per day. During the second of the two tests, while the locomotive was under fire continuously for 740 hours, the time on the road was only a little more than 460 hours—a daily average of approximately 15 hr. on the road and 9 hr. at terminals. Since the average time of cleaning fires at terminals and intermediate points on the runs was 25 min., it is evident that these locomotives could have spent several more hours per day on the road had they been needed.

Another endurance test was made on the Northern Pacific in 1926 when a Mikado type locomotive, No. 1844, ran from Seattle, Wash., to the Twin Cities freight terminal on a freight train, a distance of 1,897.6 miles without being uncoupled from the train. This was a continuous movement of 109 hr. 30 min., during which the locomotive was fired with four different types of coal and the boiler was supplied with several different types of water, some of them foamy in character. Total terminal delays en route were 4 hr. 43 min., an average of 19 min. at each division terminal. At the end of the run the inspection disclosed nothing requiring repairs or mechanical attention.

These tests confirm the experience of more than one railroad that, given a high standard of maintenance, kept up systematically at the time of the 30-day inspections, freight locomotives are quite capable of road service averaging considerably better than 20 hr. a day if the volume of traffic and arrangement of schedules permit the requisite frequency of dispatching.

It would seem, therefore, that the risk involved in the inability of the railroads to increase their supply of freight locomotives in proportion to the increase in traffic demands is a reasonable one.

This answer, however, is contingent on one important condition. That is, that there be no letdown in keeping up the present high standards of locomotive maintenance. In this connection, it is significant that Messrs. Eastman and Stevenson, in their addresses before the American Society of Mechanical Engineers, both indicated that they had this point very much in mind.

To lower the factor of safety further by a failure in the supply of materials needed for this purpose would create an unreasonable risk sure to be the cause of unfortunate results.

War Production In Railroad Shops

The subject of the utilization of railroad shop facilities for the production of materiel needed in the arms program has been under discussion for some time and it is now reaching the point where there is some criticism, by inference at least, of the fact that the potential manufacturing capacity represented by the machine tools and shop equipment of the railroad repair shops have not, before now, been used in the production of goods now being made in new or converted plants. In other words, it is asked by some critics, why have the excess facilities of railroad shops been allowed to lie idle while new plants have been built and new facilities installed in them?

If there is any argument at all it would seem to revolve around the conception of idle facilities or excess capacity as related to railroad shops. What is the excess capacity of a railroad shop—is it represented by idle machines, or idle men, or what? No one familiar with railroad shop work will deny the fact that there are many machine tools in almost any large shop that are idle some part of the time that the shop is working; there are many operations in locomotive repair work, especially on the larger machines, that are of such nature and in such relatively small volume that there just isn't enough to absorb the capacity of the machine. Some of the big wheel lathes, quartering machines and boring mills are in this category. Then again while it is true that most of the facilities are used for one full shift and a large part of the facilities are also used on a second shift the third shift probably finds most of the shop facilities idle part of the time. Here then, as far as machine hours is concerned, is some excess capacity but production is not achieved by machine hours alone—man hours are needed to round out the picture. And, in the race between the armed forces, war production industries and the railroads for skilled shop men the railroads have come off a poor third.

Most of the war production industries have solved a large part of the problem of the demand for man-hours by the installation of modern high-production machinery which can turn out quantities of machined parts far in excess of the general type of tools found in railroad shops and those parts will meet a standard of accuracy in most cases that can not be met by the average railroad tool.

There would be no point in carrying this discussion to great length, for even a comprehensive analysis of the problem would result in the same ultimate conclusions. If industrial production of any type is wanted there are certain things that are absolutely essential—a plant structure, plant facilities, an adequate labor force and an efficient management. For the job of repairing the locomotives required to keep the railroads running at present high levels the railroads seem to be equipped in all important respects with the essentials to do that kind of a job. If, for example, a contract to build a thousand field guns or a thousand tanks were handed to any railroad shop in this country it's a reasonably safe bet that the job couldn't be done, along with the present output of locomotives, without installing additional shop equipment or hiring additional skilled men. There are, however, many shops that might take a substantial volume of sub-contract work and work it in on the first and second shift periods of present operations without adding greatly to either facilities or labor force. But, when it comes to third trick operation we are faced with the fact that the machines are there but the men to run them are not.

The production capacity of present plants, with present labor forces, can be materially increased by the installation of modernized facilities, many of which can even now be secured on reasonably short deliveries. So, to end all discussion of this question let's find out what it is that is now needed that can be done with the railroads' existing production capacity and get busy and do it. At the same time it is worth remembering that the railroad shops can turn out almost any kind of a job of a character for which they are equipped if they are given the few added facilities or men to increase output with present forces or absorb machine hours that are now idle. But in any contemplated program it will be dangerous to forget the major job for which they exist—to supply motive power and rolling stock for any traffic demand, whatever it may be.

New Books

MACHINE TOOLS AT WORK. *By Charles O. Herb. Published by the Industrial Press, 148 Lafayette St., New York. 544 pages, 6 in. by 9 in.; 434 illustrations. Price, $4.00.*

This book deals throughout with machine tools in action, and shows actual examples of shop practice selected to illustrate a wide range of applications. The 434 illustrations represent jobs on a large variety of the most modern types of machine tools, such as are used for turning, drilling, milling, planing, grinding, broaching, etc.

All operations of the same general character are grouped together. For example, one chapter contains operations on lathes of the ordinary type; other chapters feature turret-lathe operations; thread cutting with dies; tapping operations; drilling and boring with standard and special machines; planing, shaping, and slotting operations; milling, broaching, grinding, and honing as well as gear-cutting and miscellaneous jobs.

Close-up views show not only the actual machining operations, but the tooling, work-holding, and other auxiliary equipment.

This book is intended not only to supplement a shop or school course, but also to provide a general work of reference covering the practice in many classes of thoroughly modern shops.

Great Northern

Car-Shop Devices

By P. P. Barthelemy*

Shop-made labor- and lift-saving tools which help speed up freight-car repairs

There has never been a time when so much depended on efficient and expeditious action on the part of all car-department employees. We are apparently doing quite a good job; however, we must further exert ourselves for a still better performance, so it can never be said that the car department did not contribute its full share toward winning the war.

Because of labor and material conditions prevailing, which will most certainly become much more critical, a great deal of forehandedness is necessary. Thorough organization and the much wider use of labor- and time-saving devices are highly important. The repair material situation is also one that calls for careful planning, with much more economical use of new materials by well-developed and effective reclamation and repair programs. Much ingenuity must be exercised in making satisfactory substitution for, or repairs to, defective old parts where new replacements are ordinarily made.

Watch your scrap piles carefully; many reclaimable castings find their way there, as do also miscellaneous structurals of various sizes and lengths, small plates, both new and second-hand, that can be used instead of new. In repair work calling for short sections of structurals or plates, reclaimed materials can generally be used, since it is not always important that they be exactly to the dimensions of the part they replace. Truck sides, truck bolsters, couplers, knuckles and yokes are among the most frequently used items in large steel castings and on which extensive reclamation is possible. Draft gears, brake beams, journal boxes, wedges and bearings are other items on which an effective material saving can be made, and if reclamation is intelligently handled their use will result in no increased service hazard.

The freight car is still the main spring in the transportation of war and other bulk materials, and it is a fortunate circumstance at this critical time that the service condition of freight cars in general is at the highest peak ever attained. There are exceptions, as evidenced in our through trains by an increase in the number of old "pelters," cars evidently drawn from restricted use or temporary retirement, and pressed into service to help out the war transportation effort. The intent is commendable, but why were not such cars placed on repair tracks, given a thorough inspection and conditioning for service prior to such loadings? A train, like the proverbial chain, is no stronger than its weakest link. Cars loaded with important defense materials are found with such critical defects as old breaks in center sills; body bolsters with old breaks in critical stress areas; draft members in poor condition and draft gears

* Master Car Builder, Great Northern, St. Paul, Minn.

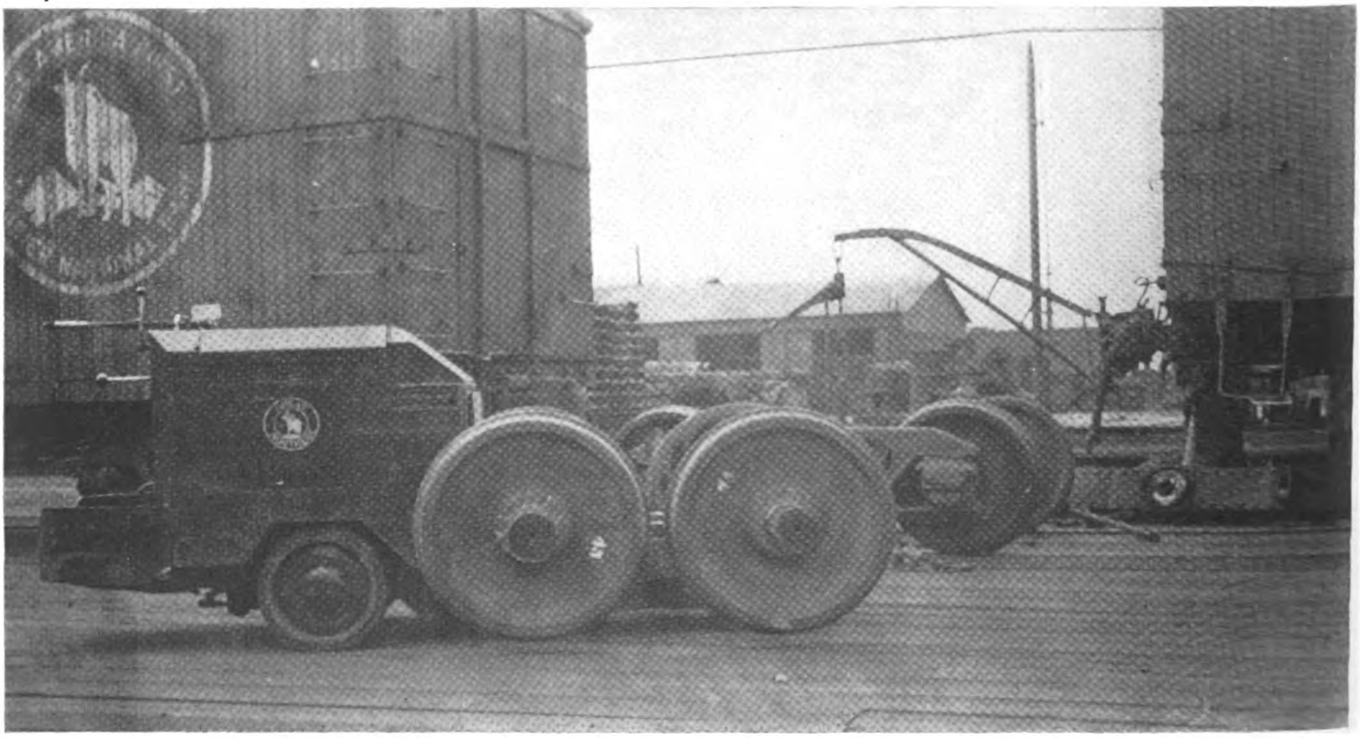


Fig 1—Electric lift truck for handling car wheels

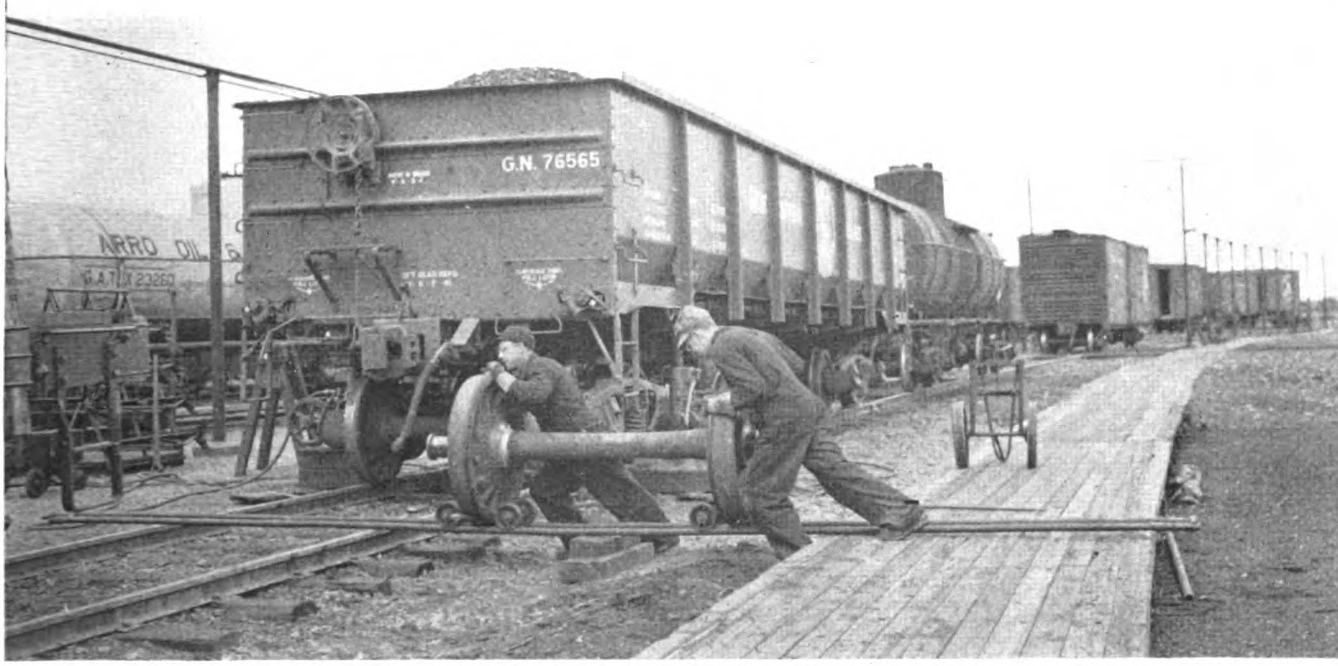


Fig. 2—A wheel dolly for moving car wheels across the track

broken and worn out; couplers badly worn; trucks in poor condition and other items. These fifth columnists should be properly conditioned for heavy train service or relegated to their proper place, as surely with all the good cars we now have, the use of these hazardous individuals in important trains can and should be avoided.

Keep the trains rolling without avoidable mechanical interruptions. See that cars are in operating and commodity condition prior to being set for loading. This feature has been stressed for some time, but in some quarters, at least, there is room for improvement, particularly on cars to be loaded with long-haul materials, and very much so if such haul is to be over rugged mountain territory. The car once loaded must be kept moving and not delayed for mechanical defects. This is where the good car inspector shines, for he's the lad on whom we must depend. Levelheaded judgment, based on knowledge and wide experience, is necessary in making his decisions and in keeping cars moving. Any novice can slap on a lot of bad order cards and gum up the service, but your good inspector is the one who knows when not to bad-order a car. Most of that knowledge must come from extended active service and cannot be acquired in a few weeks of intensive training.

On our heavy, long-haul fast trains, where most of the cars in the train are destined to terminals 1,000 to 2,000 miles distant, in which case some bad orders in transit are to be expected, a comprehensive inspection and emergency repair plan is necessary. There are key points where some cars are set out and others picked up. The inspection at such points must be thorough, and loads tagged out should be promptly switched and set on repair tracks for immediate attention. If possible get these cars back in the same train, especially when there are only two or three such fast trains a day. In order to do this fast, co-ordinated work, it may be necessary to have a second, possibly a third-shift rip-track force. When not on emergency work, these shifts can do routine repairs. The plan works out very well, and, although it has some obvious drawbacks, it helps "keep them rolling."

An extremely important feature in the ordinary train yard that is a great help in avoiding setouts is thoroughly organized yard repairs, handled directly in conjunction with train inspection. Besides such ordinary work as changing brake shoes, etc., there is a large number of repair items that can be handled if proper facilities exist, and if adequate preparations have been made. These include brake pins, brake hangers, air hose, a variety of vital bolts and nuts missing, rebrassing, journal box attention, safety appliances, cotters, uncoupling devices, knuckle pins, hand brakes, train line repairs, etc. Necessarily, this is all fast work. Some of the more commonly used devices, such as brake shoes and keys, may be spread along the tracks and if carefully placed on the ties just outside the rail they do not constitute a hazard. In some yards, depressed material boxes with the tops flush with the yard surface, are used, although in many instances water and ice make these impractical. Several neat and compact material racks located outside the yard or at viaduct piers are necessary so that the required part may be quickly obtainable. Paint-spotting rails across the yard opposite each material rack enables yard repair men to locate it quickly.

Such racks should preferably be of steel, well painted, with good doors, preferably sliding to save room. The interior should be painted a light color and must be well arranged with ample shelving and space for jacks, large bars, etc. The material in all racks should be of uniform arrangement and the different pockets marked for size of item as far as possible. There must be a daily check of these materials racks, at which time replenishing must be done to keep all items fully stocked. Thorough supervision of yard inspection and repair work is imperative, and, in case of very important trains, it is well to have a supervisor present to back up the inspectors in making critical decisions.

The rip track is an important factor in keeping the cars

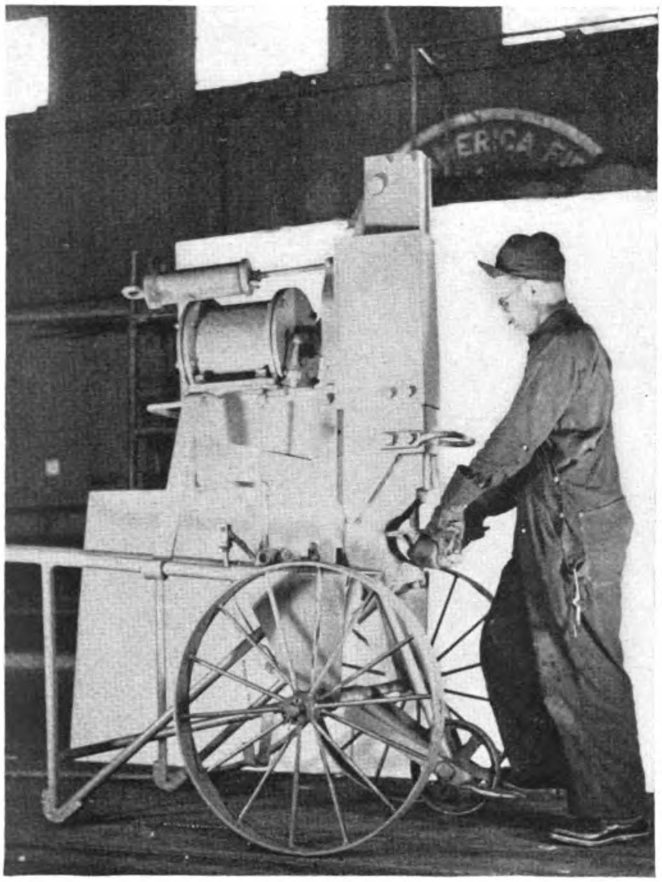


Fig. 3—A portable jam riveter

moving, and its personnel, organization and equipment must be given the attention they deserve. It must not be looked upon as just a place where, somehow or other, wheels, couplers, draft gears and a hundred other items are handled. Loads must be immediately repaired, and the prompt repair of empties helps save many service-car-days. To accomplish these ends, rip tracks must be well equipped with the best tools and devices for that class of work. Necessary materials must be on hand and must be kept convenient and in an orderly arrangement, so that there will be a minimum of lost motion in getting it where it is needed.

The prompt handling of emergency repairs, as well as others for that matter, particularly on foreign cars, requires far-sighted preparation as to repair parts, and often a considerable amount of ingenuity in making an effective substitution when the exact repair part is not on hand. Those in the East and Central districts, where neighbors are many and nearby and borrowing of material is easy, do not realize the disadvantage of the fellows located in the Northwest, where large interchange points are few and far between, and where, therefore, Smith and Jones cannot readily borrow materials from each other.

Some of the rip track layouts seem to have "just happened" as there is little evidence that plans were checked by competent car department officers. Rearrangement of unsatisfactory facilities should be made as opportunity affords. Tools and devices should be of a character to reduce manual labor to a minimum. All ordinary repair tracks are equipped with air tools and the indispensable cutting and welding torch. Motorized jacks for heavy lifts are great time savers.

An unbelievable amount of time and heavy manual labor can be saved and repairs to cars expedited by a wide use of special jigs and devices designed to be best adapted to local conditions. There are hundreds of these, large and small, in use at different repair points, but their concentrated use is far from being as general as might be expected. Too many are still doing things the hard way. There should be made at each point a careful study of local needs, and devices adaptable to local conditions be provided. For rip track work, where movements are usually considerable, lightness and easy mobility are essential.

Since wheel changing is one of the most frequent of the major rip track operations, and wheels constitute

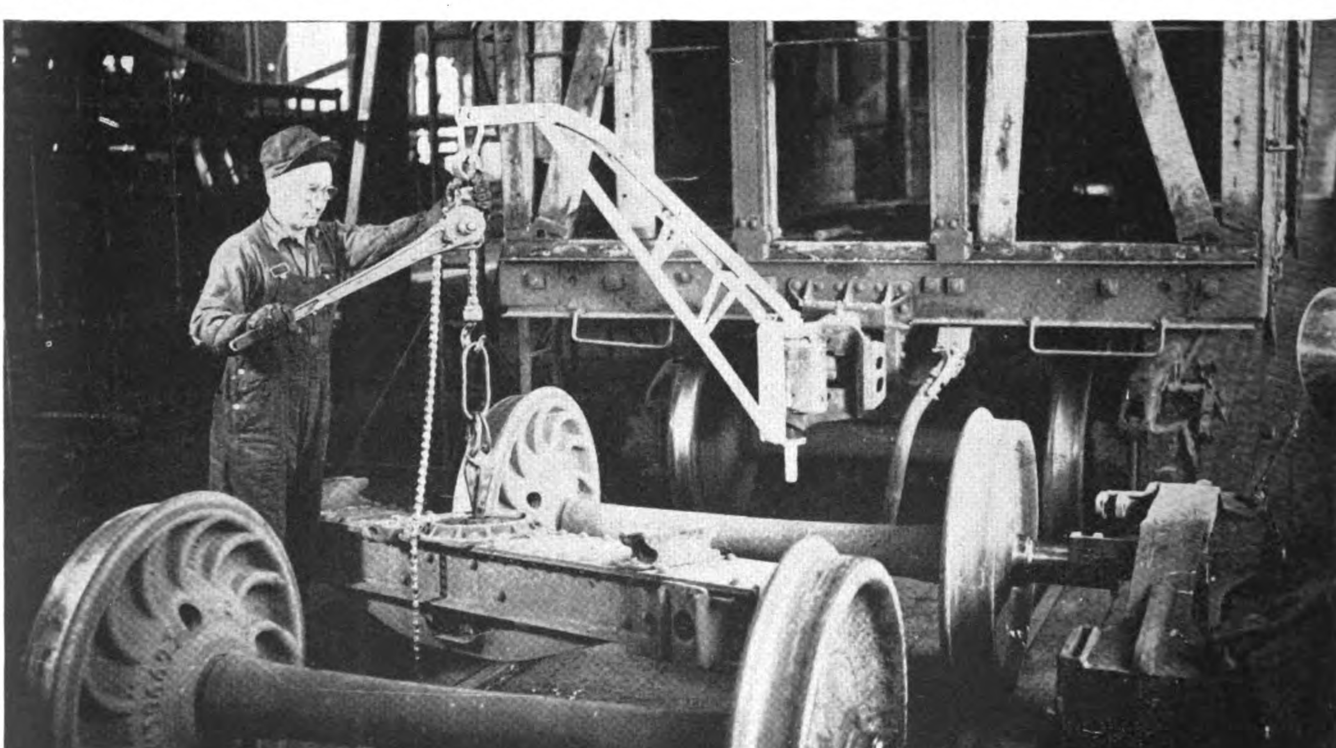


Fig. 4—A light truss boom applied to the coupler at the knuckle pin hole for lifting truck parts

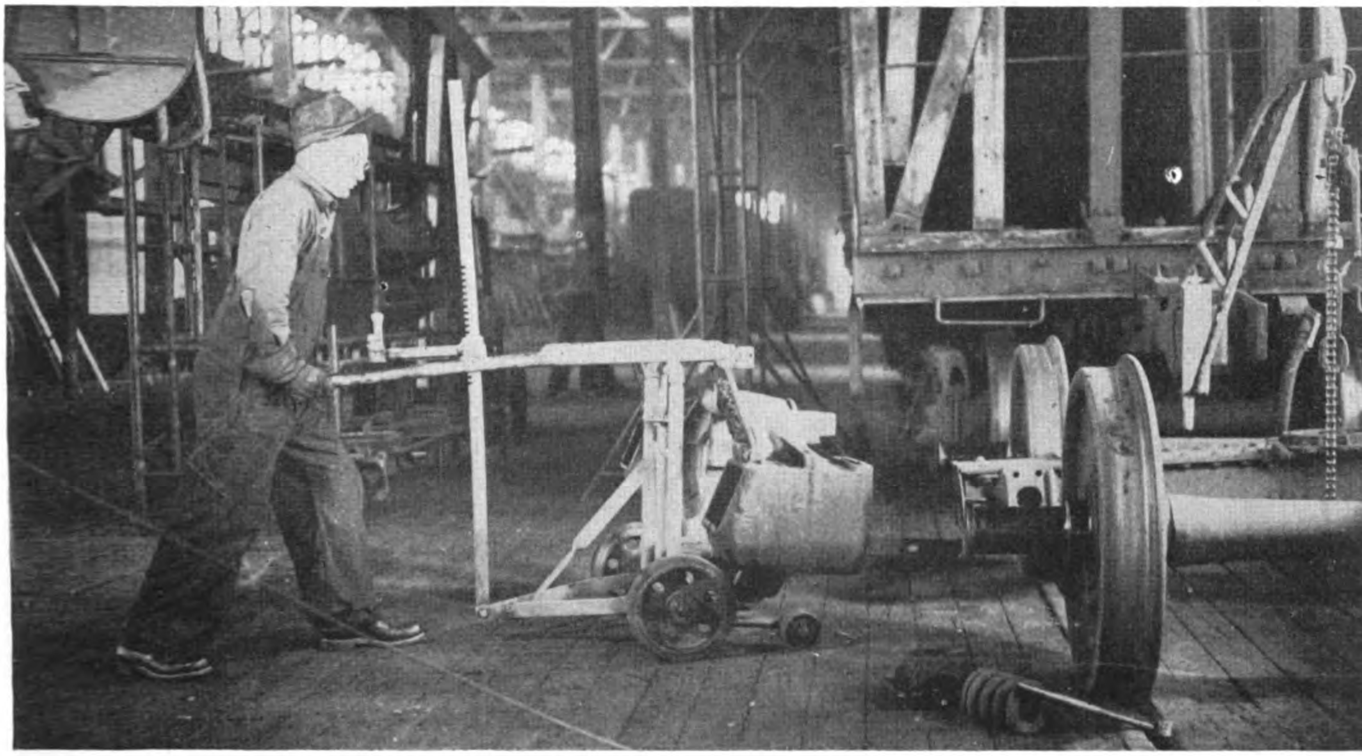


Fig. 5—A device for lifting and moving truck side frames into place on axles

the heaviest material item, handling facilities for these are important. For quick wheel changing, particularly where loads are handled, powerful easily transportable air-motor-operated jacks are essential. The transporting of the wheels from storage to the car must be quick and easy, as must also be the actual removal from the car of the defective wheel and the placement of the renewal. Standard-gage material tracks, where available, still constitute the cheapest wheel transportation, since there exists no more economical methods than rolling. A light, easily portable horse trestle, fitted with quick hoists for handling truck frames and bolsters, is another lift and time saver. Scooter dollies for taking the wheels from the truck to the service track, and the good wheels from service track to the truck are very helpful.

Turning of wheels on repair tracks should be avoided or reduced to a minimum. The use of the old crutch wheel stick applied to the journal, while almost universally banned, can still be found on some rip tracks. The collar crutch stick should also be banned for obvious reasons. A good general device is some form of cam or lever lift applied to the center of the axle. Air cylinders at regular turning points are effective, as are also some light turn-tables; where a large number of wheels are turned at one location live rollers at the inside of the turn with curved rail on the outside are highly effective but infrequently adapted to rip track layout. Rip tracks can be so laid out that, from the time a shipment of wheels is received until the bad order wheels are again loaded on the car, not a single turning operation will be necessary.

Other frequent and important rip track operations are coupler and draft gear renewals. The handling of the heavy draft gear is especially difficult. A light jack-operated rig, mounted on wheels and mobile, equipped with bracket for supporting gear, is very convenient for both removal and application.

Good light-metal devices such as ladders of various lengths, jack-horses, car horses, portable scaffolds, light air or other quick jacks for box repackers, easily portable riveting outfits with good light portable oil rivet heaters, and a variety of other devices, are great aids. Illustrations and brief descriptions of a number of shop-built time- and lift-saving devices and appliances, adapted to rip track or to shop work, are shown.

All rip tracks, except the very smallest, should have

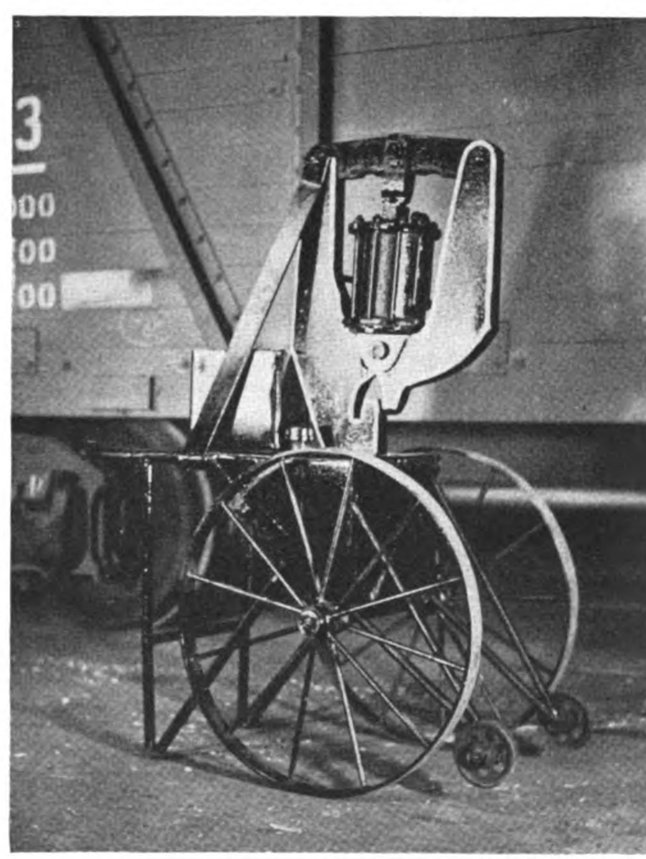


Fig. 6—A pneumatic cam riveter

facilities for doing air-brake cleaning and A.A.R. Rule 66 Journal-box Packing, so that, when cars are set out for other repairs, these periodic repair items can be done, thereby saving near future setting out, and the consequent lost car service days, also avoiding old dates but, most important, insuring first class upkeep, eliminating train delays due to air failures and hot boxes. Since car mileage directly influences these items, their upkeep is of particular importance where cars are so intensively used and where so may are loaded with important war materials. These rip tracks should also be equipped for commodity conditioning and other comparatively light repair work, including washing cars in localities where that is required. A great deal of repainting can also be done, since with proper equipment such as mobile paint sprays and scaffolds and stencil guns, that work can be done as well and almost as cheaply as at shops. Handling such items on rip tracks

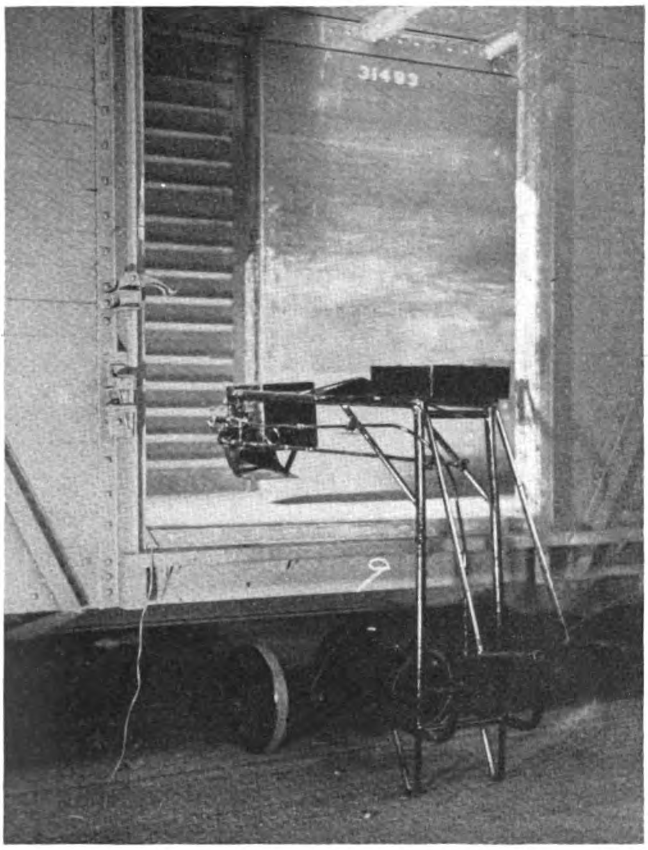


Fig. 7—A rivet heater which stands on the floor and extends inside a box car

not only keeps the force fully occupied, but is also a big help in maintaining cars to a higher standard and in increasing time intervals between shoppings.

General and Intermediate Repairs

While this article is devoted chiefly to inspection and running repairs, it would not be complete without a few words regarding general and intermediate work since the general condition of a car has a major influence on safety and continuity of train service. In some sections of the country, general requirements are such that cars, particularly box, must be shopped every 10 or 12 years in order to keep them up to high commodity condition requirements. In other sections, the demands are such that there is use for cars in practically all ranges of commodity condition, and under those conditions there is a tendency to neglect important upkeep items which result in too frequent set-outs of cars, usually under load, on account of failure of worn-out parts. Under those conditions, there should be a comprehensive program for intermediate repairs at proper intervals at which time trucks, draft gears, draft members and other parts vital to safe running should be given a thorough overhauling, thereby eliminating interruptions in train and car movements resulting from failure of these neglected parts, vitally important at this time and important at all times.

For general overhaul, a long-range shopping program should be worked out, one that provides for shopping cars as far as is possible during periods of lightest demand. Like cars should be put through in as large groups as possible, since, in that way thorough preparations can be made, cars put through stations; work specialized; and time- and labor-saving devices best adapted to meet requirements installed. Concentrating heavy work at certain shops may require diverting part of the ordinary work to other points. Any heavy-repair program undertaken should be thorough in order to fit cars for many years of uninterrupted serviceability, exclusive, of course, of ordinary wear and periodic items.

Handy Labor- and Lift-Saving Devices

In handling repair work, both on light repair tracks and in the shop, every practical means should be employed to expedite the work by making each operation faster and easier for the mechanic, take out the heavy lifts and eliminate heavy-lift hazards. For many years, we have made a sort of hobby of developing labor-saving devices that would accomplish this and also bring about a reduction in personal injuries. This plan has been followed, not only at major shops, but at all points even to the smallest rip track, so that these devices are not the brain-children of a single individual, and neither were they developed by the men at a single shop or rip track.

Supervisors, mechanics, and safety committees alike, have taken a keen interest in the matter and the results have been flattering. Mechanics like to use the easy way that eliminates heavy awkward lifts and hauls. Encouraging device suggestions from the mechanics doing the work is always good practice and a big help in bringing out new devices; it also helps build up the fellowship feeling so necessary in successfully carrying on the work. Invariably, there are a few mechanics on the job with an aptitude for working out trick labor-saving devices, and latitude should be given such men to exercise that ability. Accidents due to heavy lifts and other awkward heavy handlings have been reduced to a small fraction of what they formerly were. Most of these devices are original ideas adapted to local conditions; some were borrowed from other sources, even the automotive industry, and modified as necessary best to suit local needs.

In selecting or devising labor- and lift-saving equipment, there must be sufficient use to justify each. If for use other than stationary, the device must be easily and quickly transportable and quickly set up. Keep weight and size as low as possible consistent with safety, for easy mobility. Use light wheels of reasonable size with roller bearings so as to be readily handled about the shop by one man. Usually one pair of wheels, a pair of legs and bars for handling is the best arrangement. For the ordinary portable device, roller bearings can be made from small steel rods as the wear is negligible; take out the manual lift wherever you can. Use hose of minimum size to save weight, and, incidentally now,

to save rubber. Welded pipe lends itself best to the construction of most of these various devices. For safety's sake use new pipe. In working out labor- and time-saving devices, do not overlook the ordinary rip track. Be it a train assembly point or an intermediate terminal, the expediting of car repairs is of primary importance.

Special consideration is necessary if considerable distances must be covered; therefore, devices must have the highest degree of mobility and versatility. Often, also, there is opportunity for making rearrangements in rip track layout that would be comparatively inexpensive, but would be far reaching in future savings. A wide publication of handy devices, jigs, etc., of which there is a multitude, should be advanced by those having them. Again, don't forget the light repair track where the use of time savers will serve not only to expedite load repairs but will frequently be the deciding factor in saving another car-day.

Labor-saving devices, always essential, assume an importance of the highest order under present war and labor conditions, and no effort should be spared in adopting and devising special appliances adaptable to local conditions.

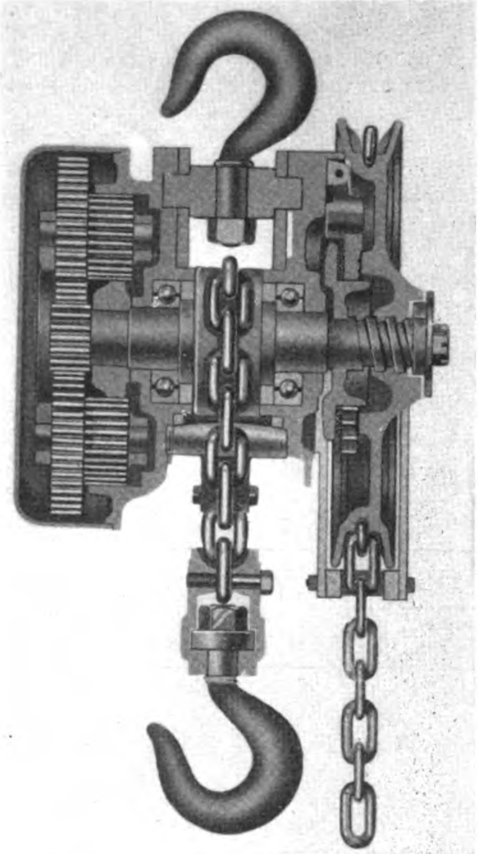
The light electric lift truck, which is shown in Fig. 1, is used in making deliveries of car wheels and carries two pairs of wheels at a time. This truck is very flexible in use, adapted to make short turns and is employed for a variety of purposes about the car shop and rip tracks. The wheel dollies, shown in Fig. 2 are used for moving car wheels from standard-gage service tracks or platforms, across to the track on which they are to be used without the necessity of turning and rolling the wheels. The dolly track is made of two 1¼-in. pipe sections, spaced 10 in. apart, by means of light plates welded to the bottom and serving as base plates. Multiple pipe sections may be joined end to end and give any desired length of pipe necessary for cross movement of the car wheels. The two four-wheel roller-bearing carriages, illustrated, support the car wheels and both the carriages and the pipe sections, when disassembled, may be mounted on a light two-wheel truck for easy movement about the shop.

The light boom, which is shown in Fig. 4, is made of welded pipe and is attached to the coupler by a pin through the coupler knuckle hole. By means of a Coffing chain hoist, this boom may be used for lifting truck bolsters and swinging them into position in the truck assembly. Bolsters are brought to the truck job by means of a light two-wheel roller-bearing carriage, which can be easily handled by one man. A special lifting device, shown in Fig. 5 is used for applying truck side frames. This device is equipped with rubber-tire roller-bearing wheels and the lift is made through multiple lever arms, the side frame being held at any desirable height by means of the ratchet arm. This truck is sufficiently mobile to be used in transporting side frames to and from nearby stock piles, as well as for lifting them onto the axles.

The portable jam riveter and punch, illustrated in Fig. 3, is useful for light riveting and punching jobs, particularly in connection with program work. The frame, of welded pipe, is mounted on large but lightweight roller-bearing wheels so that the unit can be easily moved about the shop by one man. The special portable cam riveter and punch, which is illustrated in Fig. 6, is suitable for light work, being especially designed for door weatherstripping in connection with program work and it can also be used for many other operations in connection with car repairs. This unit is mounted on light wheels of large diameter so that it is easily portable. The light rivet-heating forge (see Fig. 7) is built to extend into the doorway of a freight car and thus proves a great time-saver for handling interior riveting jobs. This forge also embodies welded tubular steel construction with roller-bearing wheels and two convenient handles for easy portability.

Speedy Operating Spur-Geared Chain Hoist

An improved, standard-type, spur-geared chain hoist is now being manufactured which is recommended for many applications in industry where a maximum amount of speed, safety, durability and efficiency is essential. This hoist, known as the Model Y-C, is equipped with a dust guard to protect the Weston-type brake from dust



Speedy operating spur-gear chain hoist

and dirt. Heavy suspension plates provide unbreakable support between top-hook crosshead and load sheave. These plates also directly support the saddle for double-chain hookup, a new feature in this type hoist, and eliminate the use of a top yoke thus reducing the weight and headroom and permitting the hoist to hang evenly at all times. The load sheave is mounted on two heavy precision ball bearings, enclosed and protected from dust and grit. The Model Y-C embodies other features and is built in six capacities, ½, 1, 1½, 2, 3 and 4 tons. The manufacturer, the Coffing Hoist Company, Danville, Ill., states that all hoists are factory tested at 100 per cent over their rated capacity and are guaranteed against defective material and workmanship.

Reclamation of Air-Brake Hose

In view of the critical situation with respect to the supply of rubber, the A. A. R. Committee on Brakes and Brake Equipment has developed a method for reclamation of air brake hose as shown on the accompanying drawing.

All brake-pipe and signal-line hose, regardless of age, that have been sent to hose mounting plants must be carefully inspected for defects, as indicated under Rule 56 and Figs. A, C or E, A. A. R. Code of Rules for the Interchange of Traffic, and see that fittings pass the gages. Hose found to be satisfactory after being tested in accordance with the standard instructions shall be placed in stock for use on all equipment, including that in interchange service.

Hose, regardless of age, with defects as per Figs. A, C and E shall be carefully inspected for sections that may be salvaged for use in splicing hose in accordance with the instructions on the drawing. Spliced hose may be used on all equipment, including that in interchange service.

The Arbitration committee has also prepared the following changes in the Interchange Rules to be effective July 1, 1942:

Rule 9.—Modify first requirement opposite item "Air hose, applied" to read "New *or second-hand, or spliced per A.A.R. specifications.*"

Rule 56.—Causes for renewal of air brake hose. Modify Item 6 to read "Loose or defective fittings, either or both ends of hose, *or at joiner on spliced hose.*" Modify Item 7 to read "End of tube 3/8 in. or more from shoulder on either nipple or coupling, *or joiner on spliced hose.*"

Rule 57.—Modify first paragraph to read "Cars not equipped with A.A.R. Standard 1 3/8 in. air brake hose *or spliced hose per A.A.R. specifications.* For label *for new hose* see below.

Rule 62.—Modify first paragraph of this rule to read as follows: "In replacing air-brake hose on foreign cars, new A.A.R. standard specification hose *or spliced hose per A.A.R. specifications* must be used to justify bill."

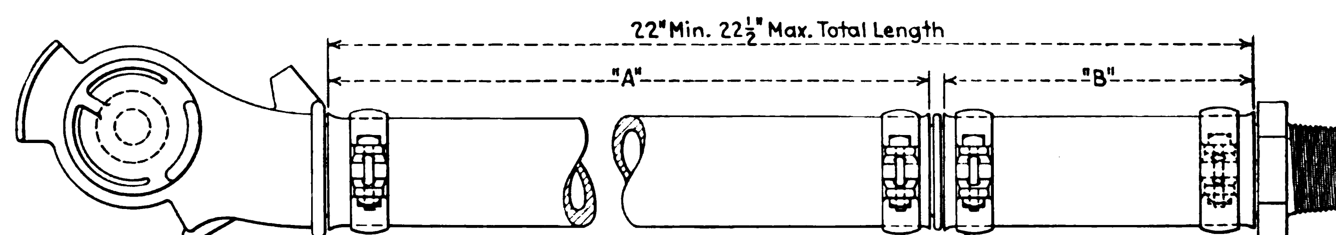
Rule 101.—Add new Item 1-A, to read: "Item 1-A. Air-brake hose, 1 3/8 in. spliced as per A.A.R. specifications, complete with fittings, applied to car, charge —— —— $1.39." Modify Item 2 to read "Air-brake hose, A.A.R. standard *or spliced per A.A.R. specifications*, average credit for fittings for same ———— $0.55."

Kind of Hose to Be Used for Splicing

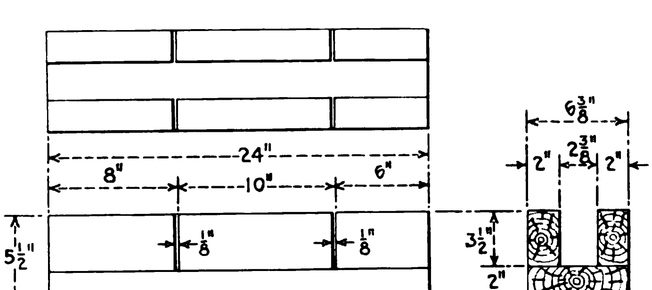
All salvaged brake-pipe and signal-line hose regardless of age, providing the inner lining is in good condition and the sections do not have defects as shown in Figs. A, C and E of Rule 56 of the Code of Rules for the Interchange Traffic.

The method to be followed in the reclamation, by splicing, of brake pipe and signal hose is as follows:

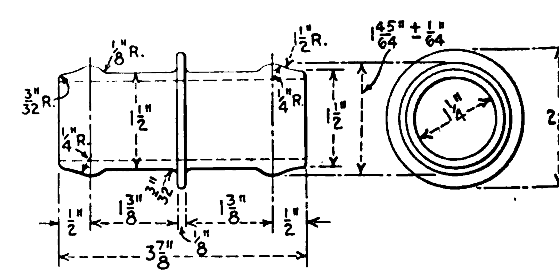
(1) Place the hose section in a miter box *A*, constructed of seasoned hardwood and fastened to a bench to prevent warping.



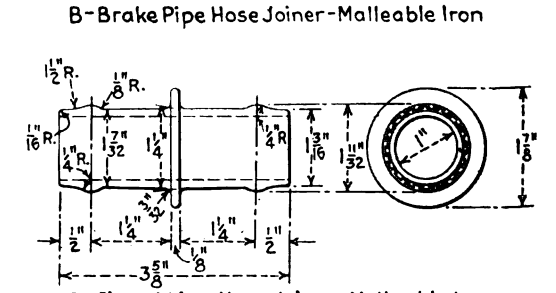
Hose	Dimensions		
	"A"	"B"	"A"+"B"
Brake Pipe	15" to 16"	6" to 7"	22" to 22 3/8"
Signal Pipe	12" to 16"	6" to 10"	22" to 22 3/8"



A- Miter Box-for hose lengths- Seasoned Hard Wood



B-Brake Pipe Hose Joiner-Malleable Iron



C-Signal Line Hose Joiner-Malleable Iron

Method of reclaiming air-brake hose recommended by the A.A.R., Mechanical Division

(2) Hold the hose section firmly against the side and bottom of the miter box to keep it straight and insure a square-cut edge.

(3) The hose sections should be cut with a knife-like instrument, experiments indicating that a 1⅛-in. by 14-in. hack-saw blade (similar to those used in power hack-saw machines) with teeth ground off and sharpened to a knife edge inserted in a hack saw frame, makes the best cutting instrument. The blade should be dipped in water to facilitate cutting and insure a clean edge.

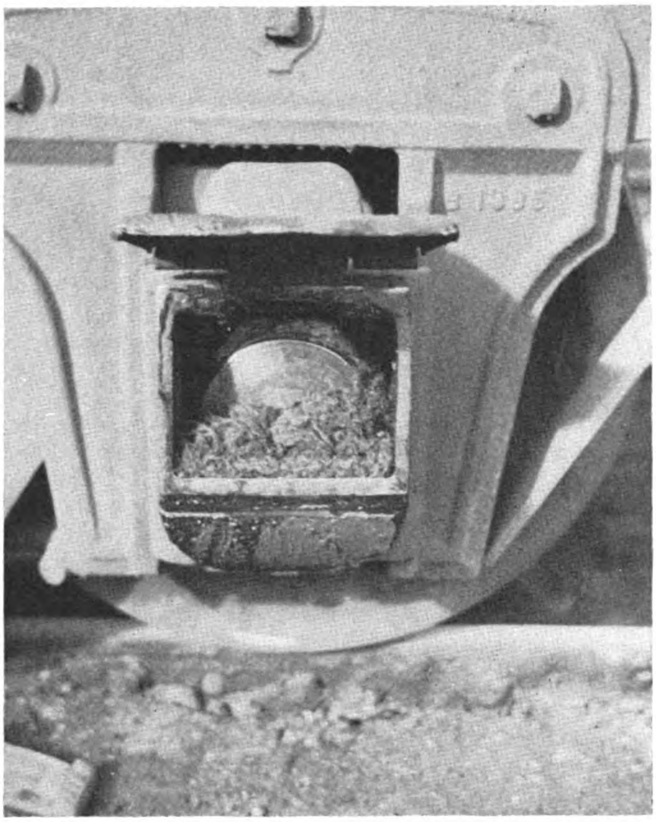
(4) Malleable iron joiners, as shown at *B* for brake pipe hose and at *C* for signal line hose, are to be used.

(5) Exposed ends of the cut hose should be covered with rubber cement to protect the fabric from moisture.

(6) In mounting joiners, the same instructions governing the mounting of hose nipples and couplings should be followed.

(7) The bolts or fastening side of clamps should be placed in the same position, as shown for the coupling end of the hose.

(8) After splicing, all hose should be tested in accordance with standard instructions.

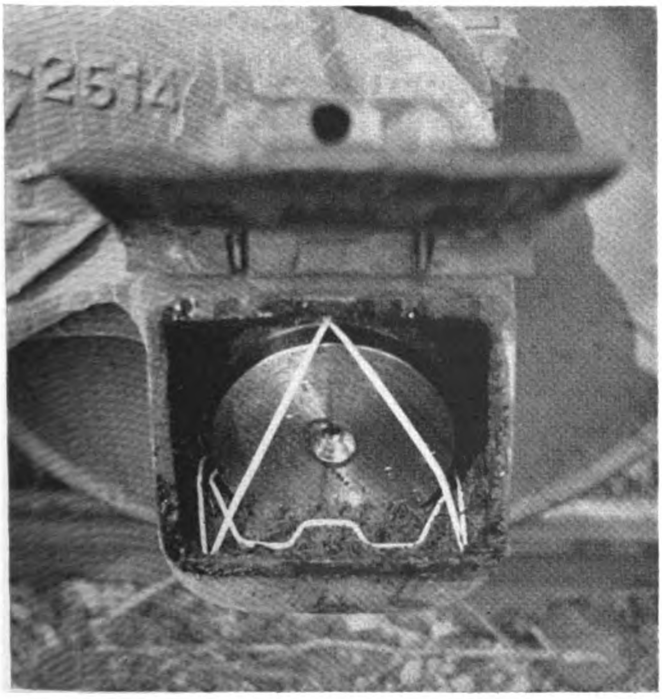


Conventional journal box with loose front packing which causes hot boxes

Packing Retainer Spring

A relatively simple and inexpensive design of packing retaining spring, developed recently by the Spring Packing Corporation, Chicago, is designed primarily to reduce the danger of waste grabs and materially reduce the labor cost of servicing railway car journals, both passenger and freight. The retainer is made of spring-steel wire applied in the front of the box so as to overcome the tendency of packing to work forward from under the journal, roll and climb up in front of the box and cause waste grabs unless constant care is exercised by car oilers to put the packing back in its proper place.

A front plug is sometimes placed in the box to hold the main body of the packing back, under and firmly against the journal, but unfortunately, the plug itself often works up and permits the balance of the packing to become displaced. The new packing retainer spring, interchangeable in one size for both 5-in. by 9-in. and 5½-in. by 10-in. journal boxes, is applied on top of the front plug and extends around in back of the collar. In case a front plug is not used the main body of the packing is extended out to the front of the box and the spring applied over it.



The packing-spring retainer applied to hold the packing in place

When the two ends of the spring are placed in the hole in the end of the wedge, this applies a strong pressure which keeps the packing in the front of the journal box firmly in place, thus holding back the packing under the journal and keeping it in compression. Most rolling of packing starts at the collar of the journal and the new packing retainer spring is intended to prevent that condition from developing. The device does not interfere with the use of a packing iron to adjust the packing alongside the journal, nor does it interfere with oiling or inspection of the side of the bearing. If necessary to remove the packing the spring is easily removed.

Air Brake Questions and Answers

HSC High-Speed Passenger Brake Equipment

28—*Q.—What is the plug connector for?* A.—To join the wire connections between the axle generator and the relay cabinet.

29—*Q.—Where is the thermo flip on the switch located?* A.—On the first and last cars of a train for manual control of the battery supply.

30—*Q.—For what purpose is a contactor located on*

the first and last cars of a train? A.—To automatically cut out the battery supply circuit to the relay cabinet when the Diesel engine is detached from the train.

31—*Q.—What is the purpose of the back-up valve?* A.—Combined with a signal whistle and whistle valve, for control of back-up movements.

Piping

32—*Q.—How many continuous pipes extend from end to end of car?* A.—Three; brake pipe, straight air pipe, and signal pipe.

33—*Q.—What type cocks are used on the brake pipe at each end of the car?* A.—Either an angle cock or a brake pipe end cock with a self-locking handle.

34—*Q.—How does the handle position of the end cock compare with the angle cock?* A.—The same. The port is open when the handle is parallel with the pipe.

35—*Q.—What type cut-out cock handle is found on the straight air pipe on some cars?* A.—On some cars this cock is equipped with a locking handle, which must be depressed before the cock key can be turned.

36—*Q.—What kind of hose connections are used between the brake cylinders and the brake cylinder pipe?* A.—Armored hose connections.

Wiring

37—*Q.—How many wires are contained in the cable which runs from car to car?* A.—Nine wires are contained in this cable, eight of which are connected to the power unit.

38—*Q.—How are these wires designated?* A.—Referring to Fig. 16, they consist of (1) application wire *AA;* (2) release wire *AR;* (3) return wire *AB* for the 64-volt power unit battery; (4) B + wire for 64-volt power unit battery supply to the DE-1 back-up valve on the last car; (5) *AC* low-speed (*LS*) speed governor wire; (6) *AE* high-speed (*HS*) speed governor wire; (7) *AD* medium speed (*MS*) governor wire; (8) *AG* and *S1,* 32-volt car battery return wire; (9) *S1* — and *S1* + 32-volt car battery supply wire for speed governor control which extends from the first to the last car.

39—*Q.—How are the application and release wires connected?* A.—In parallel.

40—*Q.—What do they connect?* A.—A master controller on the power unit and the application and release magnets of the No. 21-B magnet brackets on each car.

41—*Q.—How do the magnets function?* A.—They are energized or de-energized simultaneously by the master controller to apply or release the electro-pneumatic are energized or de-energized simultaneously by the brake valve handle on the power unit.

42—*Q.—What do the speed governor wires connect?* A.—The respective magnets of the relay valve in parallel throughout the train.

43—*Q.—How do these magnets function?* A.—They are energized or de-energized by the speed governor relays to limit brake cylinder pressure in proportion to the train speed.

The No. 21-B Magnet

44—*Q.—Of what does the No. 21-B magnet consist?* A.—Referring to Fig. 1, it consists of a pipe bracket (*55*) and magnet valve body (*2*).

45—*Q.—How many pipe connections has the bracket, and what do they connect?* A.—Three—(1) To exhaust; (2) auxiliary reservoir; (3) straight air pipe.

46—*Q.—How many magnets has the body?* A.—Two magnets, wired to a terminal block with suitable terminals to a connector (*88*).

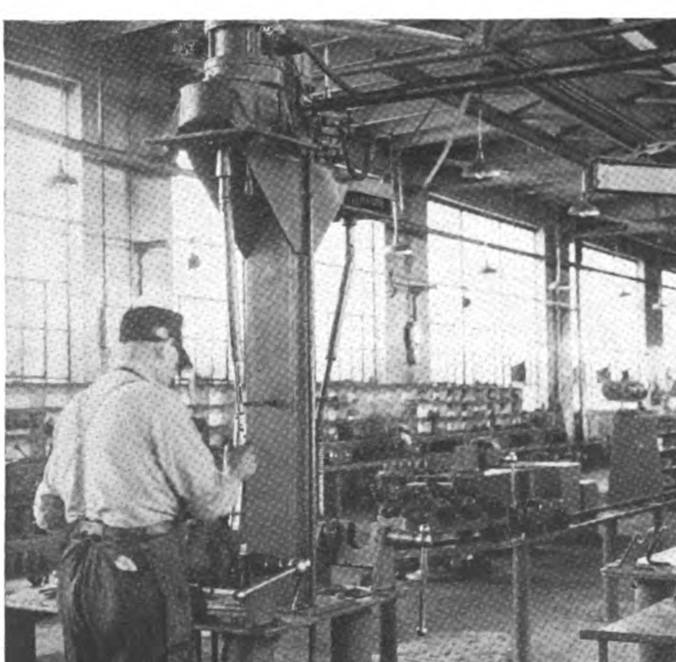
47—*Q.—How are these magnets connected?* A.—One magnet is connected to the application wire (*A*), the other to the release wire (*R*) with a common return (*C*) to return wire (*AB*).

48—*Q.—Describe the magnets.* A.—Each magnet has a coil (*20*) with an armature (*26*) and an armature stem (*27*).

49—*Q.—What does the armature stem control?* A.—Controls the positions of release valve (*62*), and application valve (*34*).

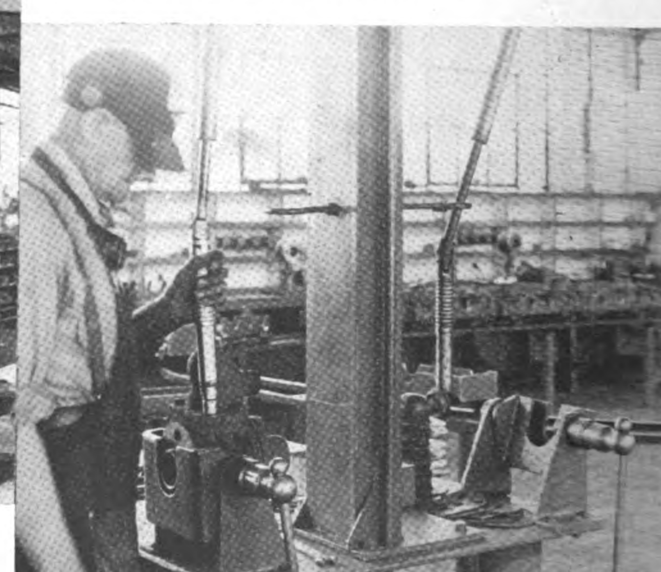
50—*Q.—What is the duty of the release valve?* A.—To open or close communication between straight air pipe and exhaust.

* * *



Above—The triple-valve repair room

Below: Flexible power-driven wrenches used in removing and reapplying triple-valve-cap nuts at the triple-valve repair room of the Denver & Rio Grande Western, located on the second floor of the Burnham shops at Denver, Colo.



Keep Them Running*

By Walt Wyre

In these days of maximum demand railroad supervisors have three valuable assets —men, materials and machines. Here are some suggestions for getting the most out of each

THE railroads are in a predicament that may be compared to a champion prize fighter, who, after a long period of idleness, finds himself pushing a paunch instead of packing a punch and suddenly forced to fight the toughest opponent of his career.

The depression period that preceded the present emergency was certainly poor training for the present job that the railroads have to do. The depression left them short of three essentials—men, machines, and material. Now, when needed as never before, other industries have hired the men, bought the machines, and acquired priorities on materials. Champions don't quit, and American railroads are champions in their field. The same ingenuity, determination, and ability that has characterized mechanical-department supervisors and officers in the past will be equal to the task of the present and future.

The job of getting maximum efficiency from men, machines, and materials is similar at every shop and engine house, but each will have some particular problem that requires individual handling. That being true, basic methods, together with illustrative examples rather than individual instances, is the aim of this article. This, of course, implies, but intentionally, ability and initiative of supervisors to apply these basic methods to individual problems.

For convenience and without attempting to evaluate relative importance, this article has three subdivisions—men, machines, and material.

Men

All men may be born "free and equal" but tax paying time leaves a doubt about the freedom, and the equality is erased by the passing years from infancy to manhood as any good shop foreman knows. Men differ in ability, temperament, and inclination. Supervisors who recognize this fact and act accordingly have less trouble and get more work done than those who do not.

"I treat all the men under me alike" is an expression often used by foremen. Fortunately for all concerned, it is seldom if ever true. Might as well say "I use the same procedure overhauling Diesel-electric and steam locomotives." There is often just as much difference in individuals as in the two types of motive power. This doesn't mean to play favorites—far from it; favoritism is a pitfall that has trapped many supervisors on an upward climb.

An example that is at least partially illustrative is a machinist we will call Jones because that is not his name, who is employed in a roundhouse. For years Jones was the bane of existence for every foreman. In that period of time several foremen came and went and each of them up to the present one had a lot of trouble with Jones. A coat of arms typifying Jones' disposition not so long ago would be a teetering chip on a sloping shoulder. Jones showed his resentment of frequent "bawlings out" by doing less and worse work than any other machinist on the job. In the machine shop he turned out fewer and worse fitting bushings than other machine men. On running repair he seldom finished a job in the usual time required by other machinists.

The foreman on the job before the present incumbent fired Jones twice, but each time was forced to reinstate the mechanic. The second time the investigation made it appear that Jones was discharged because of personal prejudice. Jones was well on the way to becoming what is known in army slang as a "gold brick." Almost every shop has one or more of the type.

When the present foreman came on the job, one of the first things he learned about was Jones. He has solved the problem accidentally or otherwise. The first few weeks after the new foreman came he said very little to any of the men and less, if possible, to Machinist Jones who was then on running repairs. The job of maintaining feed-water pumps and boosters became temporarily vacant on account of the man assigned being sick. The foreman called Jones into the office.

"Do you know anything about feed-water pumps?" the foreman asked.

"About as much as any of the other machinists," Jones replied truculently.

"How about boosters?"

"Guess I could get by on them," the machinist replied.

"All right," the foreman said, "I'm putting you on it temporarily. Here are the instruction books and blue prints."

The regular man was off longer than expected and did not return to work for over thirty days. In the meantime the foreman let Jones severely alone except through the medium of work reports and watched to see how he was handling the job. By the end of the month the foreman was forced to admit that Jones was doing a better job of maintaining the feed-water pumps and boosters than the other man had done. When the regular man returned to work he was persuaded to take the cab job which suited him exactly because it is lighter work and he hadn't entirely recovered from his illness. The feed-water-pump job was bulletined. Jones bid it in and is doing a good job on it.

The seniority system in effect on most railroads has in many instances placed square pegs in round holes and vice versa—good machine men on running repairs, good running-repair men on dead work, and so on. A situation of this kind requires diplomacy to handle without running afoul of labor organizations, but it can and has been done.

In one shop where the force was increased by bringing in men from a backshop that had reduced forces this condition was exceptionally bad. A number of men that had by years of experience familiarized themselves with

* An article submitted as an entry in the Prize Competition announced in the October, 1941, issue.

certain jobs were forced off them. This brought not only inefficiency but discontent, because men like to do things they can do well.

After a period of delays, failures, and overtime that was becoming increasingly difficult to explain, the foreman called the shop committee in and asked them to help him solve the problem. At first the committee refused to have anything to do with changing the men around, because they claimed it was tampering with seniority and seniority is sacred to most railroad men. The foreman finally persuaded them that it was as much to the interest of the men as to the company. The committee agreed on a tentative trial with the understanding that all jobs affected would be bulletined when and if requested. The result has been more and better work, fewer failures, less overtime, and the men are better satisfied than before.

Perhaps problems mentioned above do not exist in every shop, but the principle involved is applicable to some problem of personnel in every shop. College professors call it applied psychology, which is nothing but a six-bit word for a knowledge of human nature that is essential for getting cooperation.

Machines

If railroads had followed the prevailing practices of most industries of replacing machines as they became obsolescent, Japan's store of scrap iron would be much greater than it is, which is some comfort, but doesn't widen the bottle neck that exists in most railroad shops. A recent visit to shops and roundhouses in half a dozen states showed that new and modern machine tools are the exception rather than rule. Some supervisors will use this situation as an excuse for not getting the job done, but others will, like one foreman I know, manage some way.

There are practically no facilities at the small roundhouse where this foreman is located. The Diesel-electric switcher burned out an armature on one of the main generators. The master mechanic wired the foreman that an armature was shipped and to remove the damaged one and install the new one quickly as possible. At the time, the one and only available chain hoist was sent in for repairs. The foreman tried to borrow one but there was none available. It would take an extra day to have one sent from the nearest place. The foreman wired for a hoist, but didn't just sit down and wait. He hoisted the armature out—it weighs in the neighborhood of a thousand pounds—by twisting looped chains with a piece of pipe. The new armature and a chain hoist were received next day. You don't need a blue print to get the idea.

Perhaps conditions cannot be entirely corrected, but they can at least be partially overcome by one or more of four methods, usually a combination of all. They are: (1) Purchase of new tools; (2) repair or rebuild existing tools; (3) build tools; (4) get maximum efficiency from existing tools.

So much has been written and said about priorities that the idea prevails that there is no use ordering new machine tools. This is not true. The fact is it is just about as easy to get new machine tools now as it was a year or so ago, because then railroads didn't have the money and requisitions were seldom approved. Delivery may be slow and some machine tools unavailable, but one way to find out is to place an order.

Just a few weeks ago the general foreman of a shop placed an order for a tool-post grinder with an attachment for grinding reamers. He was pleasantly surprised to receive the machine in less than four weeks from the time he ordered it. It hasn't been so long ago that it took that long to get a requisition approved.

Keep machine tools in good condition. Good tools deserve good treatment, but poor tools demand it if they are to be kept in service. Too many railroad shop machines are treated like the Arkansas traveler's roof—when the machines are in use there isn't time to repair them and when idle they don't need it. In shops large enough to require a machine-shop foreman or lead man, one of the duties should be to see that machine tools are kept in condition for maximum production and to prevent unnecessary damage to the machine. A chipped tooth in a gear may, if not repaired, damage other gears and cause a breakdown at a time when the machine is urgently needed. Loose slipping belts reduce production and cause excessive belt wear.

There is an instance of worn gear shaft bearings in a lathe causing a lot of damage to the machine and a long wait for gears while the badly needed lathe stood idle. Every one in the machine shop knew the bearings were badly worn and the foreman was waiting for an opportune time to replace them, but opportune times are rare in roundhouses. The gears, not meshing properly, stripped, then new gears were needed as well as new bearings. Chances are lack of proper lubrication contributed to the bearing wear, but of course none of you readers would be guilty of allowing a machine to be operated without seeing that it was properly lubricated.

Next best to a new machine is an old one rebuilt and modernized. There are companies specializing in this type of work that will usually do a better job than would result from doing it in the local shop, and usually, because of experience and equipment for that type of work, they will do it at less cost. A lathe, drill press, shaper, and so on, rebuilt in a reputable shop specializing in that work will in most instances actually be a better machine than it was when originally purchased. However, whether sending it out or doing the work locally, complete rebuilding will in the long run prove more economical than constant patching to keep a machine running.

Use of proper tools properly sharpened will do a lot to speed up production in machine shops and in many instances reduce strain on tools and machines. Almost every mechanic thinks he is an authority on tool grinding, but it is surprising how few can grind a drill properly. A drill grinding machine or attachment for a grinder will save its cost in less than a year in many shops by preventing breakage of drills, to say nothing of increased production and better work.

In one shop a machinist helper lost so much time changing drill sizes that he was constantly snowed under. Perhaps he would be drilling a lining for a fire door when a machinist would come in with a rush job of drilling a $\frac{3}{16}$-in. hole for a cotter key in a bolt. It took longer to change drills, sleeves, and so on than the actual job. Then he had to set back again for the big job. A small machine, costing probably less than fifty dollars, was set up for handling drills $\frac{3}{16}$ in. and smaller. It requires little imagination to visualize what happened. Since installation of the small machine the drill-press operator has time to tap out nuts and chase threads on bolts—but now we are getting into material conservation, which comes later.

In addition to buying new machines, additional equipment may in some instances be built. Simple machines that do not require a lot of complicated machine work that will facilitate production may often be built in any shop. In fact, almost every shop has one or more homemade tools that are doing a good job. Rod carts, tire wagons, boring bars, various types of hooks, clamps, and other devices for handling sheet metal, pairs of wheels,

and a thousand and one home-made devices. No attempt will be made to give construction details of any one tool or machine that might be a valuable addition to your shop. Instead here is a tip that if followed will be of far more value.

Dig up all available copies of *Railway Mechanical Engineer* and if you don't have time, have some one make an index of all home-built tools described. Then from that index you can select ones needed in your shop and look them up in a few minutes. Where there are several points on a division under the jurisdiction of a master mechanic, files of the magazine could be kept at the division office and copies of the index sent to foremen at all points. This suggestion was made to the author by a general foreman some time ago.

A high-speed grinder mounted on one of the tool posts of a large planer was built at a mid-western shop and is used principally for grinding guides to produce a better finish. After the guides are planed true, cross-head gibs last longer and run cooler.

Now we have the machines—new, rebuilt, repaired or home-made. The job is to keep them running with maximum efficiency. Proper lubrication has been mentioned, as has use of proper tools, but both are important enough to be mentioned again. In many instances the machine-shop bottle neck can be considerably enlarged by using tools better suited to the job. This doesn't always mean buying higher priced tool steel, but merely the proper grade for the job it is to do. Almost any manufacturer of tool steel will be glad to send literature suggesting what grade of steel is best suited for certain uses. Carbide-tipped tools haven't been given a chance to show what they'll do in enough railroad shops. They will surely speed up machine work on cast iron as many shops have demonstrated.

Careful planning will reduce the start, stop, and go routine of machines in many shops. Sometimes an arrangement where a relief machine man works on dead work when not needed on running-repair jobs will eliminate lost motion and waiting. Sometimes three shifts in the machine shop will keep machine work ahead of two shifts on floor work. These are merely suggestions to stimulate imagination along that line.

Save that Material

The material shortage is getting shorter and prospects are better for it getting worse* If that's not clear, ask the storekeeper. He'll know what I mean.

Prevention of failure caused by broken rods, pins, etc., will, I believe, do as much as any one thing to conserve material. A broken main-rod swinging around can almost wipe the whole side of a locomotive clean. The remedy is proper testing periodically of rods, pins, etc. Magnaflux testing is perhaps the best method to follow. Whitewashing, using a mixture of whiting and alcohol, will reveal surface cracks. At any rate, every effort to forestall breakage is worthwhile and something more than an inspector with a mirror should be used to detect little cracks before they become big failures.

Every reader knows that out-of-round pins and journals cause lots of waste. Bearings must necessarily be made to fit the greatest diameter and they soon pound out. This is just a reminder that something should, if possible, be done about them.

Here are a few suggestions of what is being done in some shops to conserve material. A steel barrel is placed in a machine shop in which all broken drills, tool bits that are too short, etc., are placed. When a sufficient amount accumulates, it is sent in to the system store department. Thus it is prevented from going in with ordinary scrap.

A large bulletin board showing cost of tools and many other items is placed in one machine shop. Employees are thus reminded of money being wasted when material is wasted.

There are dozens of other ways of conserving material vitally needed for defense if space was available, but the idea as mentioned in the beginning was to stimulate thought rather than point out individual methods, and supervisors and officials of mechanical departments of our American railroads will do the rest.

* Some of the author's ideas on this subject are set forth in his story entitled "Gold Is Where You Find It" in the December, 1941, *Railway Mechanical Engineer*. Like those in many of his stories, the incidents mentioned are founded on fact.

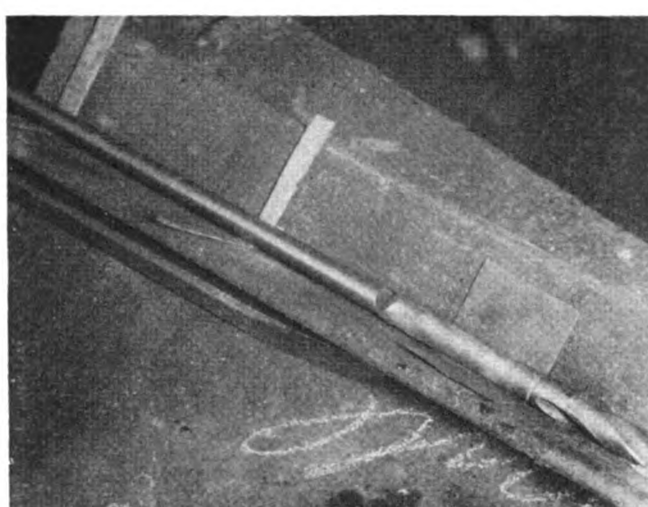
Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Lengthening Drills By Welding

Q.—Is it possible to make an extension drill from an ordinary drill by welding? I have tried this but the drill always breaks in or near the weld. Could you tell me how it can be done?

A.—If the extension is being welded to an old carbon drill, no great difficulty should be encountered. However, welding high-speed drills to a long shank is quite another matter. Prepare both drill and shank as for any welding operation, that is, a flat double vee on both



High-speed drill aligned for welding of shank extension

parts. Never grind round parts to be welded to a point. If the drill and the new shank are the same size, lay them both in the trough of an angle to hold them in line while welding. If they are not the same size, place shims under the shank one half the difference of the outside diameter of the drill and the shank. The drill must run true. Place a cast-iron flux where it will be handy when needed. Adjust the welding flame so that

the feather of acetylene extends about 1 in. from the tip. Confine the heat to the area to be welded as much as possible. Heat the mild steel welding rod and dip it lightly in the cast-iron flux. Concentrate the flame on the vee. The drill and the shank, when starting to melt, do not have the usual affinity for one another. To overcome this hesitancy add the cast-iron flux to the tip of the welding rod. When the metal puddles, add the welding rod rapidly until one side of the vee is full. Do not work the puddle with the flame. The other side of the vee is then treated in a like manner. When the welding is completed, test the drill for straightness. If the heat is running into the drill far enough to endanger the cutting edge, dip the drill in water just far enough to protect the cutting lips. Do not cool the weld in any way. After the welded area has returned to room temperature, grind off the excess metal and polish the shank.

Worn Coupler Blocks

Q.—We have in our shop quite an accumulation of worn coupler-head blocks. These blocks are worn from contact with the end of the coupler shank. What is the most economical way of repairing these?

A.—Worn head blocks may be reclaimed by welding. A large size tip is used. The area around the pin is heated thoroughly and the worn space flooded full of wear-resisting bronze. After a little practice sufficient skill will be developed so that the resulting surface will require no further treatment. The bronze rod used for driving boxes works well for this application.

Keeping Bronze From Burning

Q.—When brazing heavy sections such as locomotive frames the bronze seems to burn and form a pulpy mass, yet if a smaller welding nozzle is used the flame is insufficient to bring the base metal to a tinning heat. What should be done to overcome the bronze burning?

A.—This condition usually occurs when one operator attempts to braze a frame or heavy section alone. In this case so much heat is required to keep the base metal at the proper temperature that an exceptionally large head must be used, when this large flame comes in contact with the welding rod, it is quite likely to burn it. To avoid this have a second operator hold the heat on the frame or heavy castings with a large tip or if another operator is not available fasten a wire netting basket to the part and keep a charcoal fire in it. By doing this it is possible for the actual welding to be done with a small welding head. In this way the bronze can be applied in the proper manner and will not lose any of its tensile strength.

Safety Solvent Replaces Naphtha, Gasoline, Kerosene

The Curran Corporation, Malden, Mass., has developed a hand-wiping safety solvent which is being marketed as a safety replacement for naphtha, gasoline, and kerosene. The solvent is applicable for industrial use as a naphtha substitute for grease cleaning and hand-wiping operations. It is marketed under its blanket trade mark of, GUNK XP-92; to be used as a concentrate and to be diluted with water.

In spite of its high solvency against mineral oil or dirt, this product does not de-oil the skin, has no toxic vapors, no flash or fire point, and leaves an invisible rust preventative film so thin it cannot be detected.

Sedalia Locomotive Shop Kinks

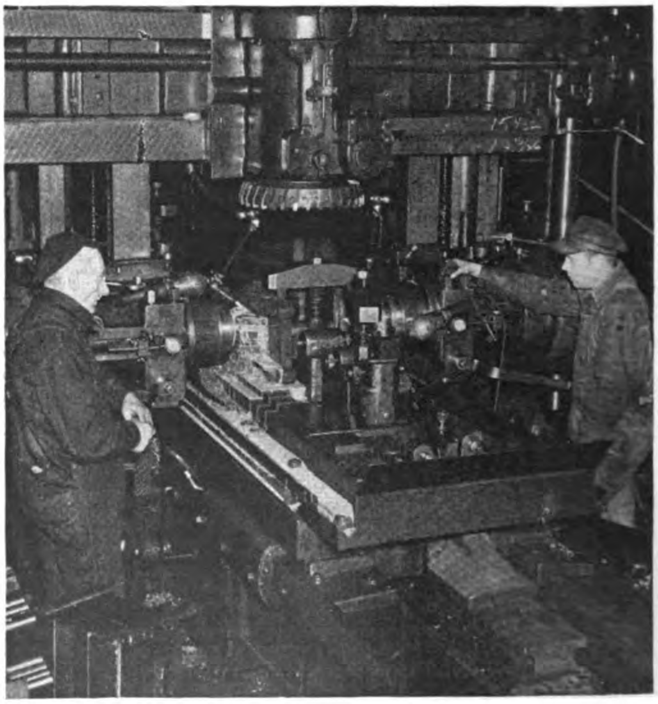
Output requirements for both system points and locally at the Missouri Pacific shops, Sedalia, Mo., necessitate a highly efficient means of maintaining production in a wide range of work. Improved tools and methods are always being looked for, even in the simplest machine operations with a view to increasing production and effecting economies.

For example, money is saved in cutting up steel bar stock with two cold saws, one of which is illustrated. This saw has a disk of 26 in. in diameter with 38 removable cutting tools or cutters; the cutters are grooved on the front bearing and a wedge insert grooved on the back bearing of the cutter. A special jig is maintained for the purpose of renewing the cutters and adjusting them. With a travel of 7 in., 14-in. stock may be handled, including steels, brass, etc. The filler blocks seen in the picture are 2½ in. by 9½ in. by 12½ in. These particular blocks were cut at the rate of 25 per 8-hr. day and are ready for use when taken from the saw. No chipping or grinding is necessary because the saw leaves a clean true finish.

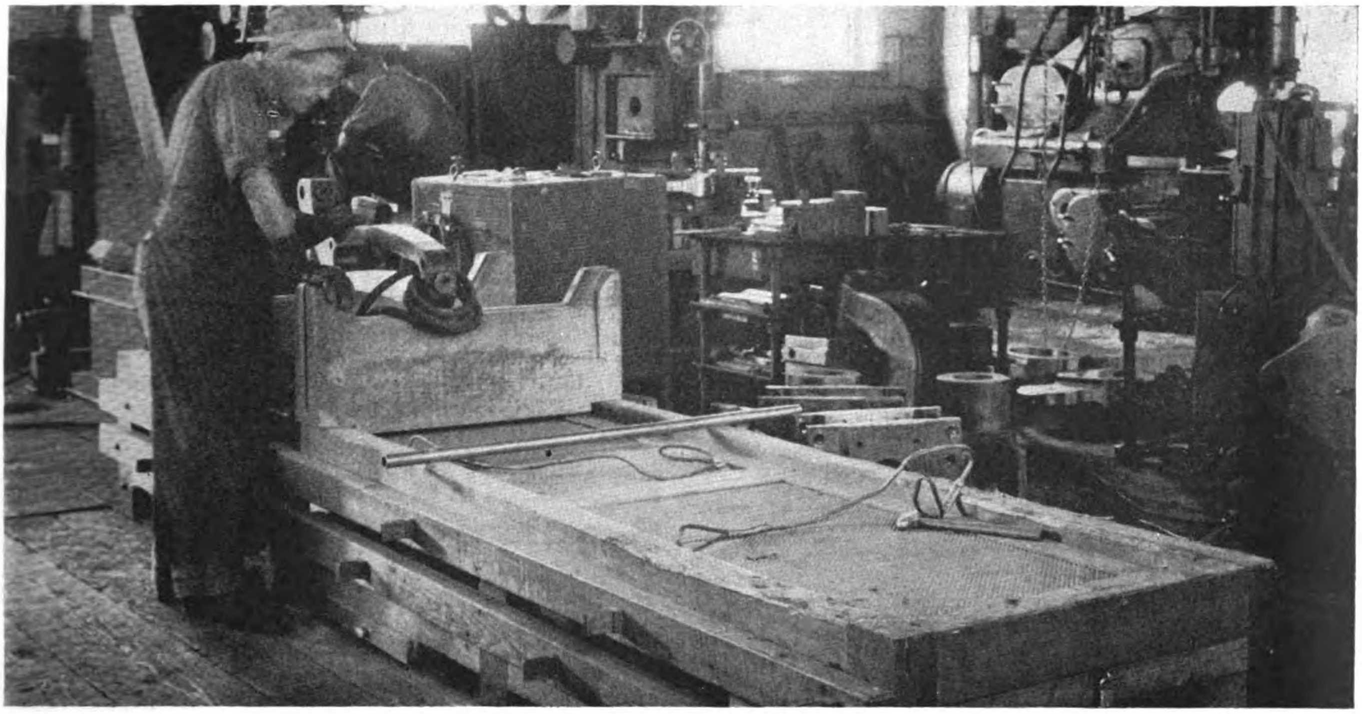
Such stock as billets ranging in sizes up to 21 to 22 in., have been cut ready for forging outside rods. Scrap driving journals up to 8 in. in size have been severed in 15 min. or less, or cut into varying thicknesses, later to be bored out and used as washers. Four-in. angle iron is piled in stacks of ten, and is then cut to any desired lengths.

As to maintenance, occasionally a cutter may be broken and have to be renewed, but in the event that the cutters catch while feeding too fast, precautions are provided by the use of three safety pins which shear off and allow power to continue while the disk remains motionless, thus preventing the disk from becoming damaged.

The milling-machine set-up, shown in one of the illustrations, consists of a holding jig designed and made at



Convenient milling-machine set-up for machining locomotive driving boxes



Inspection table designed for convenient testing of locomotive parts and easy reclamation of the Magnaflux powder

the Sedalia shops to handle all sizes of driving boxes trailer boxes and tank boxes. A wide range of work of different character may be accommodated with different jigs and set-ups quickly and accurately by means of the slotted table surface.

The jig is built in four separate units, only one of which is shown holding the driving box which is being milled. The other jigs are at the other end of the table. Four boxes may be handled at one time. These are quickly set up due to the fact that each individual holding jig is centered on the table with two universal screws operating crosswise to the table, while another is lengthwise of the table. These universal screws coming in contact with the interior of the driving box will center it and the procedure of clamping the work down is achieved by tightening the rigid clamp bar which is held in readiness by a coil spring.

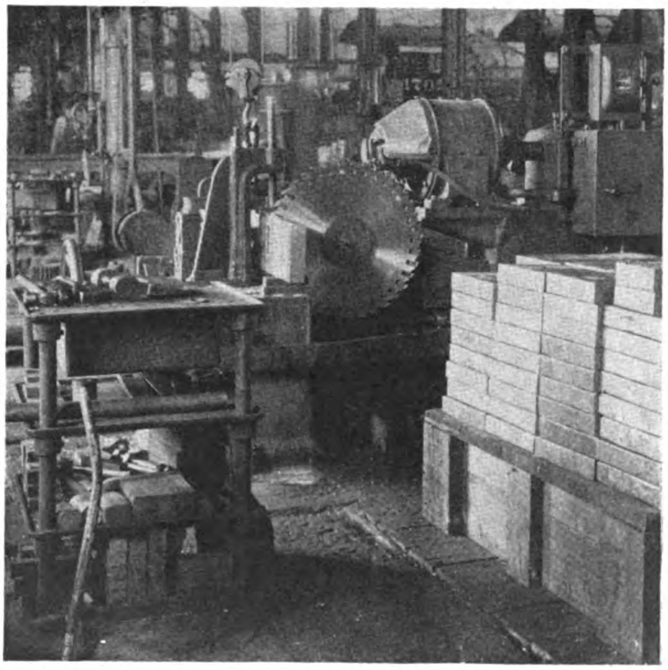
After having set up the work as described, thought is then given to the cutting feeds and speeds. A wide range of speeds is available beginning with the 16-in. spindle gear having from 12.1 to 128 r.p.m., or with a 12½-in. spindle gear ranging in speeds of 26.8 to 284 r.p.m. The corresponding table feed ranges from .367 to 18.7 in., with a rapid travel ranging from 18 to 42 in.

The milling of the shoe and wedge faces of 20 driving boxes per 8-hr. day with the oil grooves cut while the driving boxes are in this particular set up is considered the average output of this machine.

The Magnaflux Inspection Table

The sturdy inspection table, shown in one of the illustrations, is designed for convenient use and easy reclamation of Magnaflux powder used in the process of inspection. About 90 per cent is reclaimed by the use of this table.

The table consists of a 3½-in. by 5-in. wood frame standing 20 in. high and 14 ft. in length, with two 2-in. by 4-in. strips, containing the bus bars and running the entire length of the table. The slip-in plugs are spaced in a convenient manner. The table surface consists of a wire netting made in three sections, and easily removable. This netting is 1½ in. below the wood siding, allowing clearance for two movable notched stands. The stands are of 5-in. wood, reinforced with a ¼-in. by 1-in. steel band, and stand 15 in. above the table. The interior of the table is of ⅜-in. veneer boarding sloping 2 in. per foot from each end to the center opening where a drawer is located. The Magnaflux powder used in the inspection process falls through the screen



One of the two cold cut-off saws used at the Missouri Pacific shops, Sedalia, Mo.

and, at suitable intervals, the netting is removed and the powder brushed into the drawer at the center opening. In this manner it is reclaimed in large quantities, sifting it through the fine screen restores it to its original state.

Cooler, Faster Cutting With High Sulphur Oil

A castor-oil concentrate which takes more sulphur into solution than animal fats and from which a transparent cutting oil is manufactured has been developed by the Pawling Refining Corp., Port Chester, N. Y. The concentrate is obtained through a new process of distillation of castor oil which changes the molecular structure and results in a product which has "active oiliness." The heavy sulphur content increases the cooling qualities and allows for faster operation; the transparent nature of the oil permits observation of the cutting edge at all times, a great help in precision work and an important factor in obtaining longer tool life.

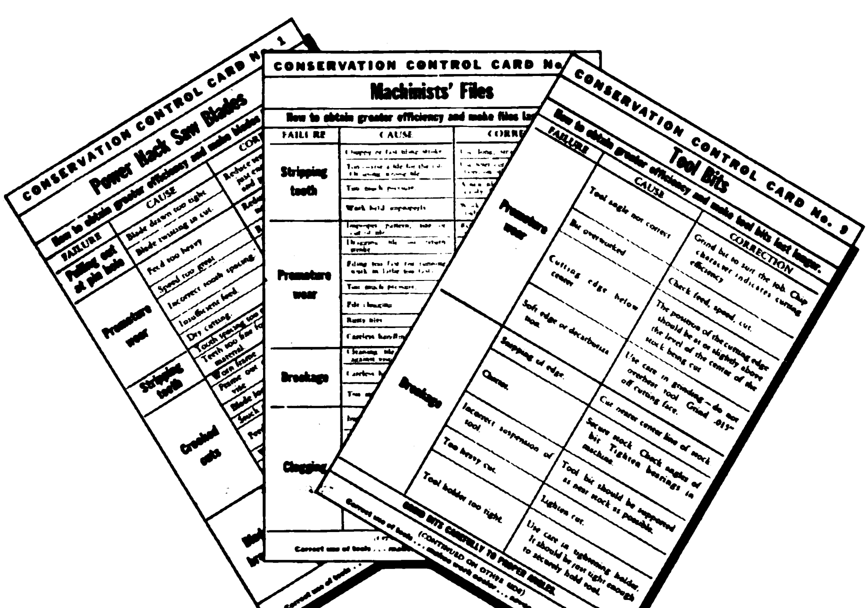
Disston Conservation Control Plan

In a nationwide effort to help American industry achieve the maximum in production with a minimum waste of time, labor and materials, Henry Disston & Sons, Inc., Philadelphia, Pa., has inaugurated a conservation control plan the basic idea of which is the instruction of workmen in the correct choice, proper use and the right care of tools. To make the instruction as sinmple, direct and effective as possible the company has devised a set of 35 instruction cards to be supplied to employees operating any one of 35 varieties of saws and tools. These cards are supplied without cost.

Each card contains concise, practical information that will lead to the most efficient and productive operation of the saw or tool covered by the particular card. There is a list of faults in operation, common difficulties and the usual mistakes in practice. The reason for each condition is stated briefly. The cards make it possible for the workman to choose the right tool for the job, see that it is set up properly, use it so as to prevent damage, keep it in good working condition and to perform his work with a maximum saving of time, effort and material.

The conservation control plan embraces the idea of the use of the cards as a valuable aid in supervision by having them distributed to the workmen by the department foreman who can personally demonstrate how the cards can be used as a handy reference in case of trouble, on starting a new job or as a check on a regular operation. The general use of the cards can serve to reduce tool breakage, cut material losses and improve production.

Among the subjects covered by the 35 individual cards of especial interest to railroad shop men are hack saws and metal cutting saws, band saws, inserted-tooth metal saws, tool bits, files of all descriptions, woodworking saws and friction discs.



Three of the 35 cards in the complete set showing the character of the instructive information for the use of shop employees

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

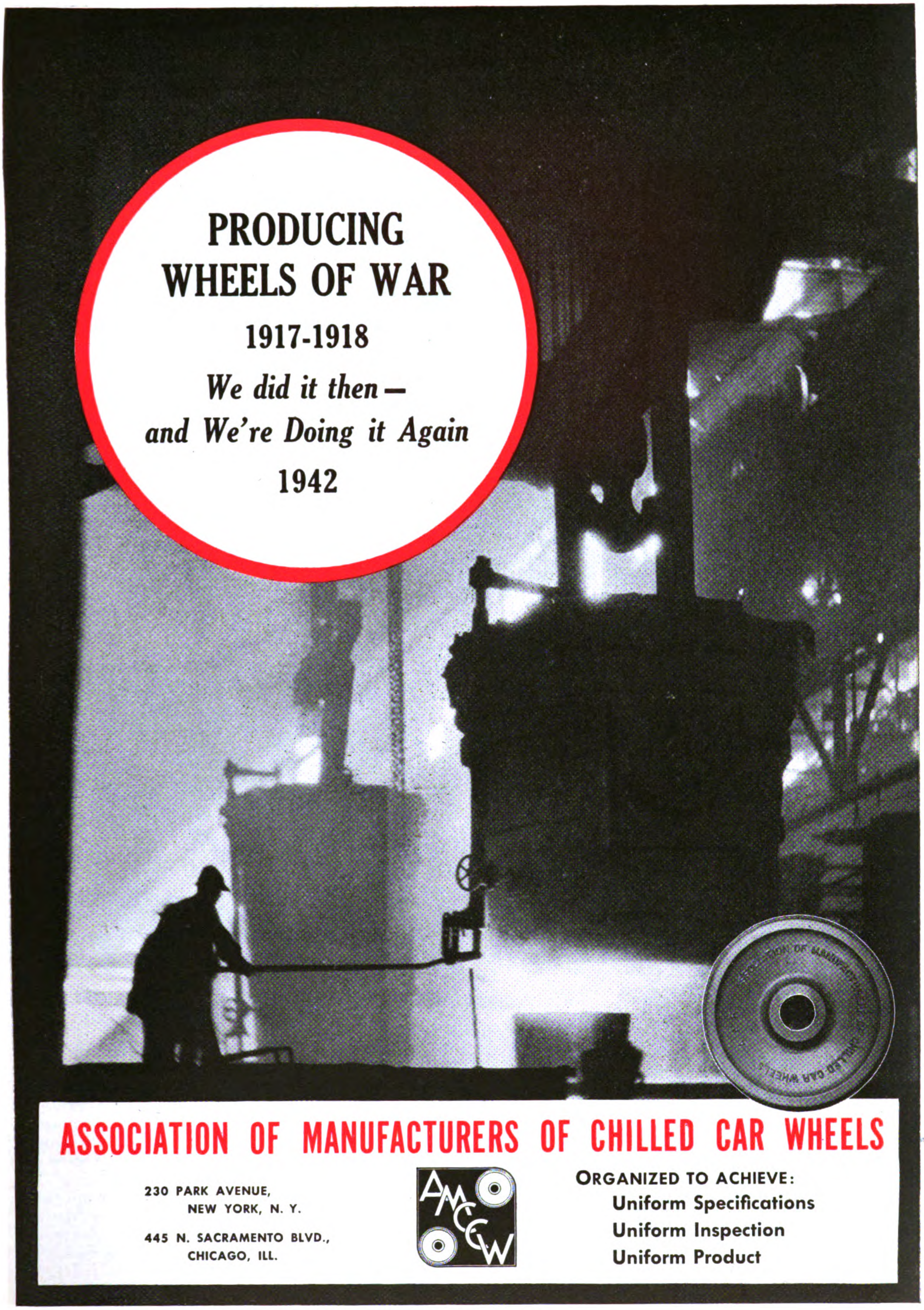
Calculating Booster Tractive Force — A Correction

In the February, 1942, issue a question concerning the tractive force of the booster was published, in the answer to which an error was made in the statement of the A.A.R. formula for computing the tractive force of a locomotive booster. The question was as follows:

Q.—What additional tractive force can be obtained by applying a C-2 booster to a Pacific type locomotive having a working pressure of 225 lb.?—M. I. C.

Part of the answer in question should have read as follows:

(Turn to next left-hand page)


PRODUCING
WHEELS OF WAR
1917-1918
We did it then—
and We're Doing it Again
1942
ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS
230 PARK AVENUE,
NEW YORK, N. Y.
445 N. SACRAMENTO BLVD.,
CHICAGO, ILL.
AMCCW
ORGANIZED TO ACHIEVE:
Uniform Specifications
Uniform Inspection
Uniform Product

A.—The A.A.R. formula for computing the tractive force of a locomotive booster is as follows:

$$T = \frac{C \times P \times d^2 \times S \times r}{D}$$

where

T = tractive force, lb.
C = ratio mean effective pressure in cylinder to boiler pressure and is
 .80 for 75 per cent cut-off booster
 .73 for 50 per cent cut-off booster
 .774 for 70 per cent cut-off booster
P = boiler pressure, lb. per sq. in.
d = diameter of cylinder, in.
S = stroke of piston, in.
D = diameter of booster driving wheels, in.
r = gear ratio

As printed in the February issue, the diameter of the cylinder in the numerator of the formula was stated as D^t. The remainder of the answer in which the application of the formula was illustrated by a specific example was correct.

Practice in Caulking Locomotive Boiler Seams

Q.—What is the general practice in caulking locomotive boilers? Should all seams be caulked on the outside only? What is the practice in applying studs to a boiler, should the studs be inserted into the sheet an amount equal to their diameter?—F. I. B.

A.—The general practice in caulking locomotive boilers is to caulk the longitudinal seams on the outside only. Circumferential seams and firebox seams should be caulked inside and outside.

The seam between the smokebox and the first shell course is caulked on the outside only. When a ring is used between the smokebox and the first shell course, caulk the smokebox to the ring and the ring to the shell on the outside only. All caulking edges should be beveled to 75 deg.

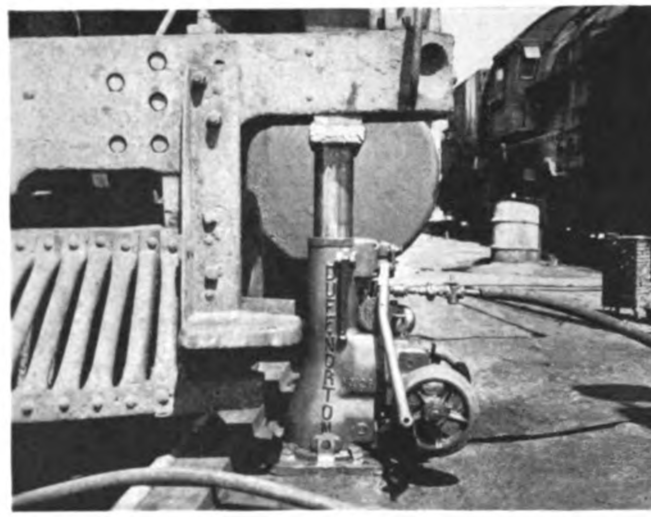
Boiler studs should be ¾ in. in diameter or over with the possible exception of the studs used for holding on the jacket supports. All studs should have tapered threads in the boiler, the general practice is to use 12 N threads (American Standard Threads) taper ¾ in. in 12 in.

To insure studs entering the sheet a sufficient distance, make the inner end of the stud at least flush with the inner surface of a single sheet, or liner when a liner is used. When applied in outside welt strips of a seam, the studs must extend in a distance at least equal to the diameter of the stud. In all cases the hole is to be gaged so that not less than one nor more than three full threads remain outside of the sheet after the stud is screwed in.

Power Jacks For Railroad Use

Improvements on its rotary air-motor jacks, making them faster and more efficient in operation, were announced recently by the Duff-Norton Manufacturing Company, Pittsburgh, Pa. The new motor operates 25 per cent faster with ordinary shop air pressures and a reduced air consumption. Used for both raising and lowering, the motor has a built-in exhaust muffler.

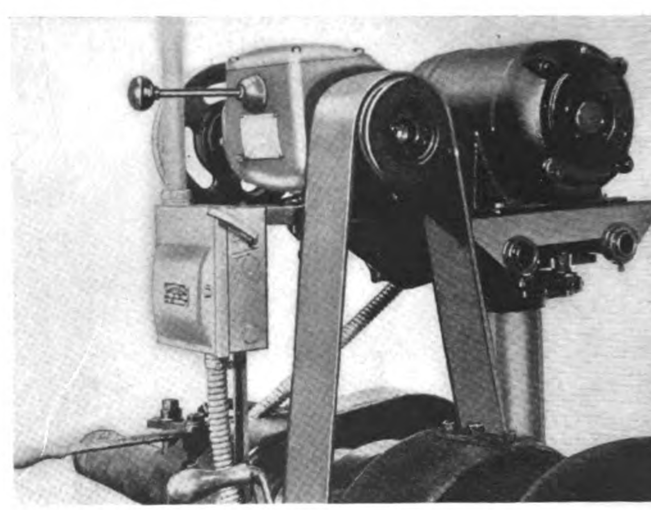
An automatic shut-off cuts the motor off when the lifting standard reaches the safe limit of its raised or lowered positions. A filter in the air-hose connection is easily removed for cleaning, assuring clean air for the motor. An up or down hand-throttle control is well guarded, with the lever position indicating the direction of operation. Rubber-tired roller-bearing wheels assure easy portability and spotting. The jacks are furnished in capacities from 20 to 100 tons.



A fast power jack

Individual Transmissions For Machine Tools

Transmissions are now available for converting old-style belt-driven machines to individually operated units using electric-motor drives. The Western Manufacturing Company, 3428 Scotten avenue, Detroit, Mich., has developed three units of different capacities which can be applied to almost all shop tools and adapted to the use of most types of motors. The Western Master is for use on 1- to 5-hp. motors, the Major on 5- to 10-hp., and the Super on motors up to 30 hp. This range of capacities makes possible the conversion of the largest as well as the smallest tools ordinarily employed in railroad shops.

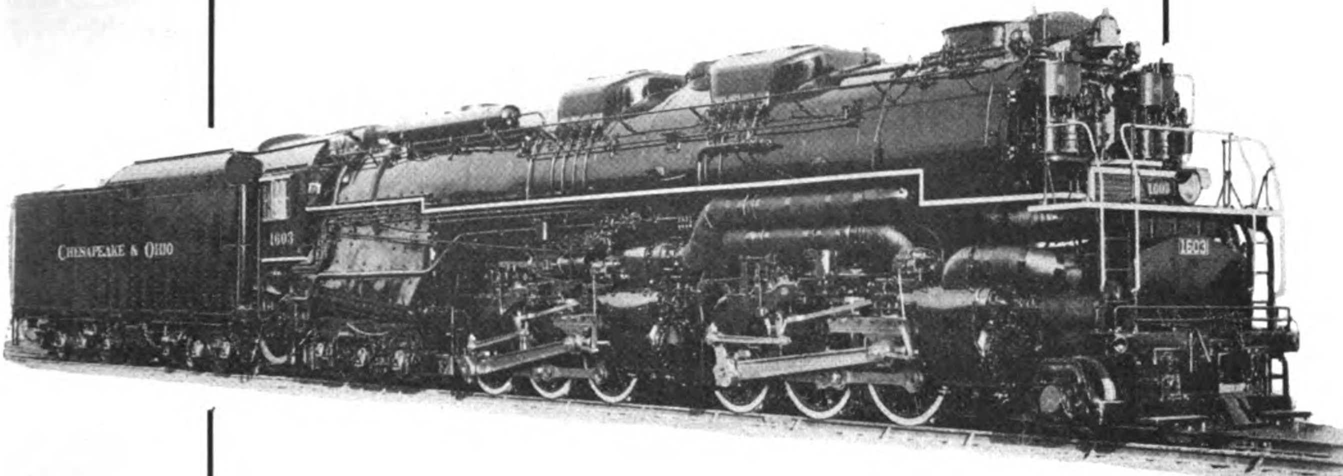


A Western transmission applied to a turret lathe which was formerly belt driven from a line shaft

Several different types of mountings are offered to suit the convenience of operators or to adapt the conversion units to various machine designs. Automotive gear-shift-type levers control the speed of operation and the transmissions have gear ratios of 1:1, 2:1, 3:1 and 4:1.

(*Turn to next left-hand page*)

The "Allegheny Type" LOCOMOTIVES



... of the Chesapeake & Ohio

The increasing demands that are being placed upon American Railroads are being met quickly and efficiently.

In anticipation of these demands the Chesapeake & Ohio purchased locomotives of a new and powerful design. These locomotives are the 2-6-6-6 "Allegheny Type" and the results being obtained are more than justifying their decision.

Lima is now building another lot of 10 of these same locomotives for the Chesapeake & Ohio which will be exact duplicates of the first lot. It pays to use Modern Power.

LIMA LOCOMOTIVE WORKS, INCORPORATED, LIMA, OHIO

LIMA
LOCOMOTIVE WORKS
INCORPORATED

High Spots in

Railway Affairs . . .

Oil for the East

There is danger that the spectacular effort that the railroads are making to rush oil to the east coast will steal the show from the remarkable all-out effort that is being made in moving wartime traffic, both freight and passenger. Week after week records in moving the oil are being smashed. For the week ended June 13, the last for which records were available when this was written, 731,520 barrels of oil were moved daily by rail to the east coast.

Vacation Travel

Vacations are desirable from the standpoint of public health, efficiency and morale. So declares Director Eastman of the Office of Defense Transportation. He does suggest, however, that vacation travel should be staggered throughout the year and that it be scheduled so that vacations will neither start nor terminate on weekends. A statement issued from the director's office on June 19 discourages the holding of conventions and group tours for the duration, if they are not closely related to the war effort. "If the American people," says Mr. Eastman, "will voluntarily impose certain restrictions upon their travel, there is good reason to hope that no drastic control over travel will be necessary."

Railroads Making Good

President M. W. Clement, of the Pennsylvania, makes very few public addresses, but when he does speak it comes right straight from the shoulder. In an address at the dedication of the new Technological Institute of Northwestern University he outlined at some length the accomplishments of the railroads in the present emergency. He pointed out that on a ton-mileage basis the railroads thus far in 1942 have almost doubled the record that they made in a like period four years ago. Near the close of his address he made this significant statement: "And, lest we forget—because it is the only industry so doing—all these improvements in the railroads, all this building up of their facilities, their engines, their cars, their capacity—all these millons—these billions—have been provided for entirely out of the funds of the railroads themselves. They have seen each of their subsidized competitors in difficulties under war conditions, while they themselves have gone on—a strictly regulated industry; a heavily taxed industry, moving without noticeable effort the largest volume of traffic they ever carried—fulfilling a destiny that could be accomplished only by the ingenuity of American transportation men and the industrial men allied with them. The railroads are handling wartime transportation, and handling it successfully and efficiently on the basis of their own resources. This is worth emphasizing because, today, when the thought is everywhere in the air that everything should be done by the government, we have here an outstanding illustration and proof of what private industry can accomplish."

Car Inspectors And Repairmen

Among the reports presented at the recent convention of the American Association of Railroad Superintendents was one concerned with securing the maximum utilization of freight cars. It pointed out that "the education of car inspectors and repairmen cannot be over-emphasized. Their physical condition should be checked periodically, with particular attention to vision. This applies to new men and those secured from other departments, as well as to the older men. Car department supervision should develop good judgment in car inspectors and skilled, careful workmanship in car repairers; otherwise cars will be sent to the repair track needlessly and repairs made that will not hold up. The inspection of trains and cars is a 24-hour job. Inspectors should be provided with the best possible lighting, so that hidden defects may come to light more easily. At many large inspection points carbide or electric lanterns with reflectors are furnished, but at most outlying yards and on interchange tracks the old-style oil lantern is still being used."

Railway Stations Modernized

Passenger cars and locomotives are not the only things on the railroads that are being modernized and streamlined. Old, disreputable railroad stations are being made over and ugly arrangements and finishes are being replaced by bright, pleasing fittings and attractive decorations. In some instances these are so designed that they cleverly disguise the fact that the original layout was too wide, or too high, or too long. It is interesting to note how the patrons react to these changes. The whole atmosphere and tempo seem to improve and speed up to conform to the new and snappier appointments. It is well that this is being done. The airports and bus terminals, all of them built within recent years, afford a distinct contrast to the old stations. Of passing note is the fact that the great two-and-a-quarter ton, wrought iron chandelier, which has hung in the second floor of the waiting room at the Union Station in St. Louis, which was opened in 1894, has been taken down and consigned to the scrap heap.

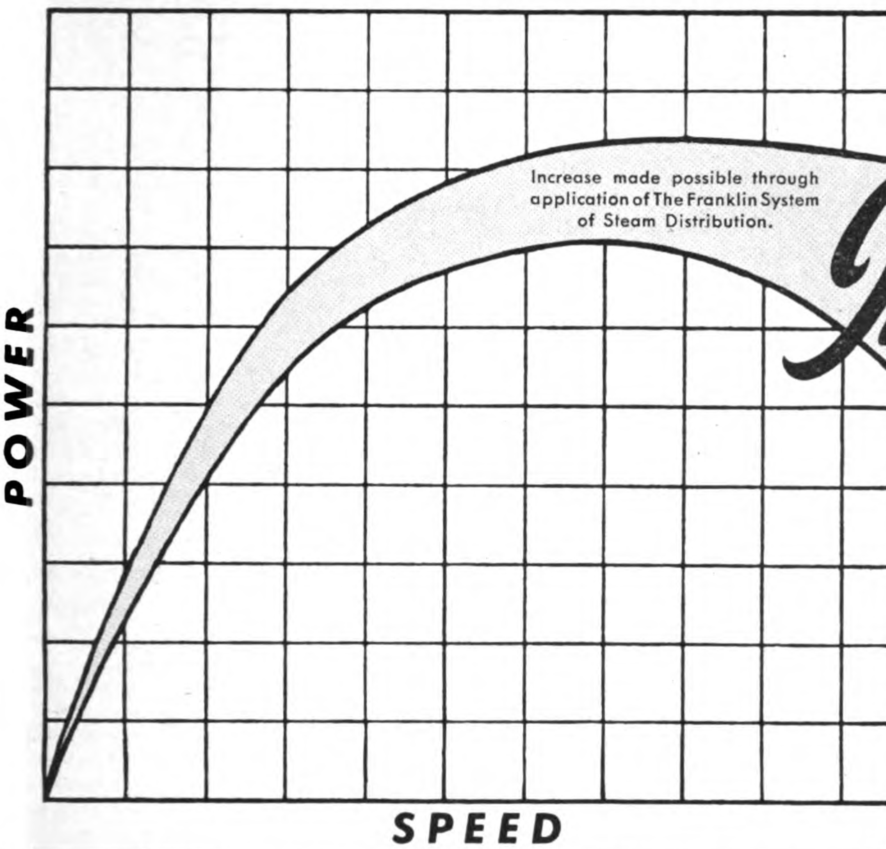
Cunningham Resigns

Railroaders are disturbed over the fact that Prof. W. J. Cunningham of Harvard University has resigned from the Transport Study Board to which President Roosevelt appointed him. He was to conduct an investigation on the relative economy and fitness of the various modes of transportation. The professor is saying nothing. Those who understand his high integrity and his ability to conduct such a study along scientific and objective lines cannot escape the belief that the dominating factor on the board, well known for his partisanship for a particular type of transportation, would not allow the professor a free hand in his studies. It is sincerely to be regretted that Professor Cunningham's services are not to be availed of, since an impartial report on this baffling problem is of first importance. If it is to be footballed about by partisans and self-seeking politicians, then the future looks bad—not alone for the transportation interests, but for the entire country, since its continued prosperity will depend upon developing that combination of transportation elements which will insure adequate transportation at a low unit cost.

Railroad Publicity

A railroad supply man complained the other day about the fact that the public did not appreciate the splendid record the railroads are making in handling the heavy wartime traffic. On the other hand, the public seems to be unduly critical about the little inconveniences it suffers, and particularly resents the lack of courtesy on the part of a few thoughtless railroad employees. Now, more than ever before, is the time for every railroad employee to be a booster, not only for his own road, but for the railroads in general. The vast sums of money being expended by the government to perfect automotive and air equipment for war purposes will, in part at least, redound to the advantage of the commercial carriers in the years to come. Meanwhile automobile and airway enthusiasts are predicting marvelous post-war improvements in highway and air transportation. According to airway enthusiasts, airplanes will become as plentiful as automobiles now are. Now is the time for the railroads to cultivate the goodwill of the public and have it thoroughly understand the part that they are playing in the present emergency. Incidentally, the railroads are not asleep, so far as expenditures for advertising are concerned, although they cannot compete with the automobile industry in this respect. According to the Association of American Railroads the expenditures of Class I railroads for advertising have been well in excess of 11 million dollars for each of the past three years.

(*Turn to next left-hand page*)


Increase made possible through application of The Franklin System of Steam Distribution.
POWER
SPEED

NEWS

Enochs Named to Manpower Policy Committee

A MANAGEMENT-labor policy committee of the War Manpower Commission, to be composed of seven national labor leaders and seven leaders of war production and transportation management, has been set up by Commission Chairman Paul V. McNutt.

Representing railroad management is H. A. Enochs, chief of personnel of the Pennsylvania. In addition to Mr. Enochs, the committee will also include a representative of railroad labor, as well as three Congress of Industrial Organization and three American Federation of Labor officials, plus six industrial executives.

A. A. R. Names Manpower Committee to Work With ODT

A COMMITTEE of railroad executives has been named by the Association of American Railroads to work with the Office of Defense Transportation's Division of Transport Personnel on "methods of speeding up the process of recruiting and training new employees, and of improving railroad personnel policies.

The committee is headed by Dr. J. H. Parmelee, director of the A.A.R.'s Bureau of Railway Economics, and other members are as follows: H. A. DeButts, operating vice-president of the Southern; H. A. Enochs, chief of personnel, Pennsylvania; W. H. Flynn, general superintendent of motive power and rolling stock, New York Central; John P. Morris, general mechanical assistant, Atchison, Topeka & Sante Fe; J. B. Parrish, assistant vice-president, Chesapeake & Ohio; and C. R. Young, manager of personnel, Illinois Central.

The ODT announcement said that Director Eastman will ask management and labor groups in all branches of transportation coming under his direction to set up similar committees "as the need for them arises."

A-1-j Priorities for Repair and Maintenance Materials

THE War Production Board has amended Preference Rating Order No. P-88, raising from A-3 to A-1-j the preference rating available to railroads for deliveries of materials essential for repair and maintenance of track, structures, signal and communications systems, cars and locomotives and other facilities. The amendment specifies that the ratings under the order may be applied without further authority for installations in which the charge to capital account is not in excess of $500 for a single project.

Another provision of the amendment prohibits the application of a higher rating than A-1-j by suppliers to replenish inventories depleted as a result of deliveries made on A-1-a orders for emergency repairs. Among other modifications of the original order is one under which railroads may not only sell material to their own subsidiaries but also to lines "not owned but customarily maintained by them or their subsidiaries."

Most of 18,000 Cars Allocated

RELEASES have been reported for most of the 18,000 new freight cars which were authorized for construction by the War Production Board following its limitation order of April 4. These 18,000 cars, which are in addition to about 9,000 delivered in January and 36,000 authorized by the former Supply Priorities and Allocations Board for construction during the three months, February-April, inclusive, will complete the 1942 car-building program. Construction will immediately follow completion of the cars remaining in the SPAB program.

Breakdown of the final 18,000 by classes of cars authorized is reported to be as follows: 6,131 hopper cars; 5,016 gondola cars; 2,428 flat cars; 2,000 ore cars; 500 covered hopper cars; and 1,925 tank and special type cars. Of the 6,131 hopper cars, 3,396 will be of steel construction and 2,735 of composite wood and steel construction; of the 5,016 gondola cars, 1,616 will be steel and 3,400 composite.

The accompanying table shows the allocation of these 18,000 cars by railroads and builders based on releases reportedly made by the War Production Board's transportation equipment branch. Certain of the cars on which the matter of design and steel is still in question are listed as unallocated.

Committee to Supervise War Work in Railroad Shops

FORMATION of a committee of representatives of railroad management, railroad employees, and the government to supervise the performance of war production work in railroad shops has been announced by Director Eastman of the Office of Defense Transportation. The committee was named as the result of a recent agreement between railroad management and repre-

(Continued on next left-hand page)

Reported Allocation of Final 18,000 Freight Cars Authorized for 1942 Construction

Railroad	*No.*	*Type*	*Builder*
Atlantic Coast Line	300	Gondola	Bethlehem Steel Co.
	100	Flat	Greenville Steel Car
Bessemer & Lake Erie	93	Hopper	Pullman-Standard
	150	Gondola	Greenville Steel Car
	20	Gondola	Pressed Steel
Birmingham Southern	86	Gondola	Pullman-Standard
Central of New Jersey	246	Hopper	Company Shops
	500	Gondola	Bethlehem Steel Co.
Chesapeake & Ohio	130	Hopper	American Car & Foundry
Chicago & North Western	250	Flat	Pullman-Standard
	25	Flat	Company Shops
Chicago, Burlington & Quincy	250	Hopper	Company Shops
	400	Flat	Company Shops
Chicago, Milwaukee, St. Paul & Pacific	2	Flat	Company Shops
Chicago, Rock Island & Pacific	300	Flat	Company Shops
Delaware & Hudson	80	Hopper	Company Shops
Detroit, Toledo & Ironton	50	Flat	Greenville Steel Car
Duluth, Missabe & Iron Range	500	Ore	Pullman-Standard
	500	Ore	General American
	500	Ore	American Car & Foundry
Elgin, Joliet & Eastern	500	Gondola	American Car & Foundry
	200	Gondola	General American
	200	Flat	Ralston
Great Northern	500	Ore	Bethlehem Steel Co.
Louisville & Nashville	100	Flat	Mount Vernon Car
Lehigh Valley	960	Hopper	Bethlehem Steel Co.
Missouri Pacific	570	Gondola	Pressed Steel Car
New York Central	1,100	Gondola	Despatch Shops
	303	Flat	Despatch Shops
New York, Chicago & St. Louis	50	Flat	Pullman-Standard
New York, New Haven & Hartford	13	Flat	Company Shops
Norfolk & Western	200	Hopper	Virginia Bridge
Northern Pacific	489	Hopper	American Car & Foundry
Pennsylvania	797	Hopper	Company Shops
	1,000	Gondola	Company Shops
	22	Flat	Company Shops
Pere Marquette	250	Flat	Greenville Steel Car
Reading	300	Hopper	Company Shops
	300	Gondola	Company Shops
St. Louis Southwestern	50	Flat	Company Shops
Shippers Car Line	3	Flat	American Car & Foundry
Southern Pacific	90	Gondola	Company Shops
	10	Flat	Company Shops
Virginian	536	Hopper	Company Shops
	100	Gondola	Company Shops
Wabash	100	Gondola	Company Shops
Western Pacific	300	Flat	Mount Vernon Car
Unallocated	2,050	Hopper	
	500	Cov. Hopper	
	1,925	Tank & Special Type	
Total	18,000		

"Tailor Made"

YET STANDARDIZED!

Each Security Arch is "tailor made" to suit the individual class of power in which it must function. But so effectively is Security Arch Brick standardized that only six different Security Brick patterns are needed for more than 50% of the Security Arch Brick used.

This high standardization reflects the engineering and experience of the American Arch Company.

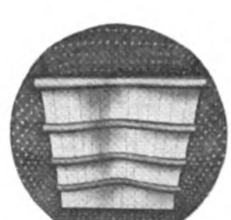
It simplifies the application of the brick arch and saves the stores department a vast amount of trouble.

This foresight of the American Arch Company in adhering to standards is but one of the many ways in which the American Arch Company is serving the railroads.

There's More to
SECURITY ARCHES
Than Just Brick

HARBISON-WALKER REFRACTORIES CO.

Refractory Specialists



AMERICAN ARCH CO.
INCORPORATED
60 EAST 42nd STREET, NEW YORK, N. Y.

Locomotive Combustion Specialists

Orders and Inquiries for New Equipment Placed Since the Closing of the June Issue

Locomotive Orders

Road	No. of Locos.	Type of Locos.	Builder
Reading	4	1,000-hp. Diesel-elec.	Baldwin Loco. Wks.
	3	660-hp. Diesel-elec.	
	3	1,000-hp. Diesel elec.	Electro-Motive Corp.

Freight-Car Orders

Road	No of Cars	Type of Cars	Builder
Great Northern	500	75-ton ore	Bethlehem Steel Co.

Freight-Car Inquiries

Columbia Steel Co.	10	50-ton flat	....
Republic Steel Corp.	20	50 ton twin hopper	....
	15	70-ton triple hopper	....

sentatives of shop craft and clerical employees to produce war materials in railroad shops under existing labor contracts.

Otto S. Beyer, director of the ODT's Division of Transport Personnel, heads the newly-formed committee. Other members are: George A. Landry, chief of the Staff Service Branch, Production Division, War Production Board; Andrew Stevenson, chief of the Transportation Branch, Division of Industry Operations, WPB; M. W. Clement, president of the Pennsylvania; W. M. Jeffers, president of the Union Pacific; Ernest E. Norris, president of the Southern; B. M. Jewell, president, Railway Employes' Department, American Federation of Labor; F. H. Knight, general president, Brotherhood of Railway Carmen of America; H. J. Carr, vice-president, International Association of Machinists. George M. Harrison, grand president of the Brotherhood of Railway Clerks, will serve as an alternate for one or the other labor members when there is a matter up which affects his organization.

WPB Transportation Branch Appointments

O. J. Parks and Charles P. Whitehead have been appointed consultants to the Transportation Equipment Branch of the War Production Board. Mr. Parks, who will specialize in car building and conversion of car building plants, has been general superintendent of equipment for the General American Transportation Corporation. Mr. Whitehead, who will advise on problems arising in the manufacture and production of gasoline, steam, electric, and Diesel locomotives, has been vice-president in charge of sales, General Steel Castings Corp.

N. W. Univ. Opens Its Tech. Institute

On June 15 and 16 the new Technological Institute of Northwestern University, at Evanston, Ill., was formally dedicated, bringing to fruition the dream of Walter P. Murphy, chairman of the Standard Railway Equipment Manufacturing Company, Chicago, whose gift of $6,735,000 in 1939 made possible the new engineering school which will feature co-operative engineering courses to promote industry and transportation through education.

Mr. Murphy, whose inventions have lead to numerous improvements in many fields, and especially in the construction of freight cars, had little formal education himself, but had a keen desire to establish an educational institution to help young men in the transportation and engineering fields. He was born at Pittsburgh, Pa., on January 26, 1873, and entered railway service at the age of 16, later becoming foreman of the Missouri Pacific shops at Coffeyville, Kan.

In 1898 he joined his father in the rail-

Walter P. Murphy

way supply business at St. Louis, Mo. He later took out more than 40 patents designed to eliminate waste in construction or to strengthen and lengthen the life of railway equipment. In recent years he has been living in California. On his physician's orders, he was unable to attend the dedication of the new institution that will perpetuate his ideals, if not his name.

Mr. Murphy planned for many years to establish an institution which would combine theory and practice in engineering. For that reason the new institute will operate on the "co-operative plan," with the students alternating at study and employment in industry and transportation, gaining first-hand knowledge of the practical application of the principles studied in classrooms. Civil, mechanical, electrical and chemical engineering will be taught, and the curriculum for all courses will be based on a five-year period, including eleven quarters of laboratory and classroom instruction and seven quarters of employment in industry.

On the second day of the dedication ceremonies 15 honorary degrees were awarded to noted industrial, educational and governmental leaders, including the honorary degree of Doctor of Laws, granted in absentia to Walter P. Murphy.

Revised and Emergency Material Specifications

The standardization and simplification of materials for railway use has been carefully considered by the various committees of the A. A. R. Mechanical Division with reference to the war emergency and the necessity of conservation of scarce materials. The material specifications of the division have been thoroughly reviewed by the Committee on Specifications for Materials and Committee on Wheels and in several cases in co-operation with groups of manufacturers and technical advisory committees of the War Production Board, according to a statement recently issued by Secretary A. C. Browning.

(Continued on next left-hand page)

In some cases specifications have been completely reviewed; in other cases specifications have been reaffirmed; and in other cases emergency provisions have been provided to be effective during the war period and for a reasonable period thereafter. The revised and reaffirmed specifications have been printed on standard white loose-leaf pages to be inserted in the Manual of Standard and Recommended Practice. Emergency specifications and provisions have been printed on yellow pages to be inserted in the manual immediately preceding each present standard specification. The revised index to Sec. A of the Manual shows the 1942 revisions and emergency specifications to be followed during the war period as well as the present specification numbers. In some cases certain A. S. T. M. specifications are shown which are not reproduced for the Manual, as they are published and distributed by the American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pa.

In addition, the A. A. R. General Committee urges that during the war period materials be ordered only to specifications of this association and those of other recognized national bodies, rather than to individual railroad specifications. The A. A. R. revised and emergency specifications can be secured from the secretary's office.

Supply Trade Notes

F. B. Davis has been appointed to manage sales of Aristoloy alloy steels and Coppco tool steels in the Buffalo, N. Y., district for the Copperweld Steel Company. Mr. Davis was previously connected with the Edgar T. Ward Company.

◆

American Brake Shoe & Foundry Co. —*John S. Hutchins,* district sales manager of the Ramapo Ajax Division of the American Brake Shoe & Foundry Co., with headquarters at Chicago, has been appointed sales manager in charge of all sales of this division, with the exception of those on the West Coast and at Pueblo, Colo., which will be under the jurisdiction of *H. W. Renick,* vice-president. Mr. Hutchins was born at Arlington, Mass., on December

J. S. Hutchins

30, 1904, and after attending Yale University entered the employ of Ramapo Ajax at Chicago in September, 1925. Two years later he was transferred from the plant to the sales department and in 1930 was transferred to the Cleveland office. In 1933 he was placed in charge of sales in the Chicago district, and in 1941, Mr. Hutchins became district sales manager in charge of the entire Middle West territory.

◆

James S. Hearons, assistant manager of sales of the railroad division of the Inland Steel Company, Chicago, has been given a leave of absence, effective June 8, to enable him to serve with the Production division of the War Production Board in Washington. Mr. Hearons will work in a consulting capacity as liaison between the railroads and the Board.

S. M. Clancey, central district sales agent for the P. & M Company, Chicago, has also been appointed representative of the Peerless Equipment Company, Chicago.

◆

The H. K. Porter Company will open a plant in Blairsville, Pa., to expand its facilities for the war effort. It is anticipated that the plant will employ between 150 and 200 men when in full operation.

◆

Alfred Sontag has joined the staff of the testing machine department of the Baldwin Southwark division of the Baldwin Locomotive Works, Philadelphia, Pa. Mr. Sontag was chief engineer and sales manager of the Riehle testing machine division of American Machine and Metals.

◆

John W. Wiley, formerly with the Hyatt Bearings division of the General Motors Corporation, is now associated with the Koppers Company, American Hammered Piston Ring division, on the sale and service of that division's products for the railroads. He will make his headquarters at the company's New York office.

◆

Minneapolis-Honeywell Regulator Company.—*Fred Kaiser,* for the past three and one-half years branch manager at Detroit, Mich., for the Minneapolis-Honeywell Regulator Company, has been appointed Chicago branch manager to replace *Charles L. Saunders,* who recently resigned to join the War Production Board at Washington, D. C., as chief of the instrument section in the machinery division. *D. J. Peterson,* branch manager at Buffalo, N. Y., will succeed Mr. Kaiser at Detroit, and *Herman Seelbach, Jr.,* who has been attached to the air conditioning division at Buffalo, will succeed Mr. Peterson in that city.

Navy "E" Award

The Navy "E" burgee was awarded The National Bearing Metals Corporation, St. Louis, Mo., on May 14, and the Bartlett Hayward division of the Koppers Company, Pittsburgh, Pa., on June 13. The American Locomotive Company, Schenectady, N. Y., which was awarded the Navy "E" last November 18, continues to fly the pennant, a six months' renewal of the privilege having been made by the Navy Board of Awards beginning April 24.

Fred S. Doran has been elected vice-president of Joseph T. Ryerson & Son, Inc. Mr. Doran has under his direction purchases for all ten Ryerson plants, and other responsibilities in connection with the Ryerson war effort.

◆

The Cummins Diesel Engine Corporation of New York has announced the change in its corporate name to the Rogers Diesel & Aircraft Corporation. The offices and plant of the corporation will be located as formerly at 1120 Leggett avenue, New York.

◆

Arthur Williams has been appointed chief engineer of the Superheater Company. Mr. Williams was born in Swindon, England, in 1904, and received his technical education at Swindon college. Mr. Williams served a special apprenticeship with the Great Western Railway of England from 1921 to 1926. He came to America in October, 1926, to join the Franklin Railway Supply Company, and in April, 1927, became associated with the Lima Locomotive Works. In the latter part of

Arthur Williams

1927 he joined the Superheater Company's engineering department. He was appointed research engineer in 1930; assistant chief engineer in 1938, and manager of the production engineering division in 1939. Mr. Williams is the author of a number of papers on heat transfer which he presented before the A. S. M. E. and railway clubs. He is a member of the A. S. M. E. and an associated member of the Institution of Mechanical Engineers (London).

(*Turn to next left-hand page*)

The Gisholt Machine Company, Madison, Wis., has established a branch office at 1124 Park building, Pittsburgh, Pa., in order to be of greater service to its customers. *W. L. Sutherland* is in charge of this office and handles negotiations for the complete line of Gisholt turret lathes, automatic lathes and balancing machines in the Southeastern Ohio, West Virginia, Western Pennsylvania, and Western Maryland areas.

◆

Herschel E. Post, manager of the Houston, Texas, paint factory of the Pittsburgh Plate Glass Company, has been appointed general sales manager of industrial finishes, with headquarters at Pittsburgh, Pa.

◆

Allegheny Ludlum Steel Corporation.—*H. N. Arbuthnot,* district manager of the Detroit, Mich., office of the Allegheny Ludlum Steel Corporation, has been promoted to the position of assistant general sales manager, with headquarters at Pittsburgh, Pa. *J. D. McKnight* has been named manager of the Detroit, Mich., district sales office. Mr. McKnight was formerly assistant manager in Detroit and has been associated with Allegheny-Ludlum for the past six years. *E. E. Sanborn* has been appointed manager of tool steel sales in Cleveland, Ohio, territory.

◆

W. H. Holcomb, formerly vice-president and general manager of the Pelton Water Wheel Company, San Francisco, Calif., has been appointed assistant to the executive vice-president of the Baldwin Locomotive Works. Mr. Holcomb started with the Pelton Water Wheel Company, a subsidiary of the Baldwin Locomotive Works, in December, 1919, as sales engineer. Later, he became manager of the pump department, sales manager, vice-president and sales manager and, since June, 1939, vice-president and general manager. Before joining the Pelton company, he was with the Southern Pacific and the Pacific Telephone & Telegraph Co. in California.

W. H. Holcomb

◆

Walter Smith has been appointed western manager of the Pilliod Company with offices in Chicago, to succeed Frank Fisher, who has retired after 21 years of service. Mr. Smith was formerly manager of the western railroad division of the Vanadium Corporation of America. He was graduated from Cornell University with a degree in mechanical engineering in 1909 and entered railway service in that same year as a special apprentice on the Baltimore & Ohio at Newark, Ohio. He subsequently served in various supervisory capacities on the B. & O. and on the Chicago & North Western, and from 1913 to 1916, was inspector of locomotives built for the C. & N. W. at Schenectady, N. Y. He joined the Pyle-National Company in 1916, leaving in 1918 to serve as a first lieutenant with the 19th Railroad Engineers in France. He resumed work with the Pyle-National Company in August, 1919, continuing as a special representative until 1930 when he joined the Vanadium Corporation of America as assistant manager of the railroad division. He was appointed manager of the western railroad division of that company in 1932 and held that position until his new appointment.

Walter Smith

◆

William M. Black, president of the American Manganese Steel Division of the American Brake Shoe & Foundry Co., Chicago Heights, Ill., has been elected also a vice-president of the American Brake Shoe & Foundry Co., New York. Mr. Black joined this division in 1912 and became its general sales manager in 1934 and vice-president in 1935. He was elected president in 1940 and will continue in that capacity. He served as a lieutenant of ordnance in World War I.

William M. Black

◆

Charles H. McCrea, manager of the Cleveland, Ohio, works of the National Malleable & Steel Castings Co., has been elected first vice-president and a member of the board of directors.

Obituary

Hobart S. Johnson, chairman of the board of directors of the Gisholt Machine Company, Madison, Wis., died on May 28 after a long illness. Mr. Johnson was born in Madison, Wis., on October 7, 1873, and studied mechanical engineering at the University of Wisconsin from 1890 to 1893 when he left the university to take charge of the Gisholt Machine Company machine tool exhibit at the World's Columbian exposition in Chicago. At the close of the exposition he entered the Gisholt shops and in 1897 became shop superintendent and works manager, a position he held for several years. Later he advanced to the vice-presidency, and, upon the death of his brother Carl in 1931, became president of the company. Because of failing health, he resigned from the latter position in 1940 and was succeeded by his son, George H. Johnson.

Hobart S. Johnson

◆

Eugene W. Richey, western sales representative of the New York Air Brake Company, with headquarters in Chicago, died in the Passavant hospital in that city on May 28.

◆

Walter S. Adams, who, prior to his retirement on April 1, 1941, had been connected with the J. G. Brill Company continuously for 56 years, died suddenly on May 27. He was 80 years of age. Mr. Adams started with the Brill Company as a draftsman in the engineering department, becoming chief draftsman in the early 1900's, and later designing engineer. He was personally responsible for important developments in street railway cars and car trucks, and more than 150 patents were granted on his inventions covering transportation equipment and associated products. In recent years he was engineer of patents for the Brill Company, investigating new designs and following patent matters.

(*Turn to fifth right-hand page*)

PIERRE G. JENKS, president of the Pullman-Standard Car Export Company, and a director of the Pullman-Standard Car

Pierre G. Jenks

Manufacturing Company, who died on June 14, began his business career as a stenographer with the Pressed Steel Car Company on its formation in 1899. He was elected treasurer of that company in 1903. He subsequently was associated with the Banning Cooper Company and in 1913 joined the Standard Steel Car Company as manager of its Hammond, Ind., plant. He was elected vice-president in 1922 and in the merger with Pullman, Inc., in 1930, became president of the Pullman-Standard Car Export Company in charge of all foreign operations. Mr. Jenks served in the Spanish-American War and, in World War I, as a major in the field artillery. He was 66 years of age.

HENRY C. STIFF, retired superintendent of engineering of the Lorain division, Carnegie-Illinois Steel Corporation, Johnstown, Pa., died on May 22. He was 71 years of age.

DAVID VAN ALSTYNE, at one time superintendent motive power of the Chicago Great Western and mechanical superintendent of the Northern Pacific, and later a vice-president of the American Locomotive Company, died of an acute heart attack at Wilton, N. H., on June 7. Mr. Van Alstyne was born at Louisville, Ky., July 14, 1865, and was graduated from the Massachusetts Institute of Technology in 1886. He entered the service of the Louisville & Nashville as a machinist apprentice, remaining with that company for eight years as a machinist, locomotive fireman, and enginehouse foreman. He engaged in the foundry business for three and a half years and then served for a year as master mechanic on the Louisville, Henderson & St. Louis. He was head of the mechanical department of the Chicago Great Western from 1899 to May 26, 1904, when he became mechanical superintendent of the Northern Pacific. Mr. Van Alstyne was appointed vice-president in charge of manufacture of the American Locomotive Company in 1907. From 1910 to July, 1917, he was engaged in a consulting capacity by several organizations, including the New York, New Haven & Hartford, of which he was appointed assistant to the vice-president in September, 1914. In 1917 he returned to the American Locomotive Company, serving in various capacities until his retirement on September 1, 1930. He has since lived at Wilton, N. H.

EDWARD M. SMITH, assistant sales manager of the Electro-Motive Division of

Edward M. Smith

General Motors Corporation, LaGrange, Ill., died in that city on June 18. He was born in Susquehanna, Pa., on January 22, 1890, and after graduating from Laurel Hill Academy, Susquehanna, in 1907, entered railway service as an office clerk on the Erie. He was transferred to New York and later was promoted to special representative at Youngstown. In 1935 he resigned to become assistant sales manager of Electro-Motive.

Personal Mention

General

J. A. E. PATRY has been appointed rule and mechanical instructor, Quebec district, on the Canadian National, with headquarters at Joffre, Que.

CARL HEATON, chief clerk to the superintendent of motive power of the New York, Chicago & St. Louis (Nickel Plate), has been promoted to assistant to the superintendent of motive power, with headquarters as before at Cleveland, Ohio.

C. F. DENO, district master mechanic of the Manitoba district of the Canadian Pacific with headquarters at Winnipeg, Man., has been promoted to assistant superintendent of motive power, Western lines, with headquarters as before at Winnipeg. It was incorrectly stated in the June issue that Mr. Deno had been appointed chief of motive power for Western Canada.

TRACY CLARK BALDWIN, superintendent of motive power of the New York, Chicago & St. Louis with headquarters at Cleveland, Ohio, retired from active service on May 31. Mr. Baldwin was born at East Springfield, Pa., on June 15, 1875, and entered railway service in June, 1889, as a messenger and tool room boy for the Nickel Plate at Conneaut, Ohio. He later served as machinist apprentice, machinist and toolmaker, and machine shop foreman at that point. In May, 1905, he was appointed enginehouse foreman at Buffalo, N. Y., and five years later, he was advanced to general machine shop foreman at Conneaut. Mr. Baldwin was promoted to master mechanic of the Buffalo and Cleveland divisions, with the same headquarters in April, 1915, and in November, 1916, he was advanced to superintendent of shops at Conneaut. In February, 1923, he was appointed master mechanic of the Chicago and Ft. Wayne divisions at Stony Island, Ill., and on June 10, 1929, he was transferred to the Nickel Plate district, with headquarters at Conneaut. Mr. Baldwin was promoted to superintendent of motive power, with headquarters at Cleveland, Ohio, on December 1, 1937.

T. C. SHORTT, master mechanic of the Nickel Plate district of the New York, Chicago & St. Louis, with headquarters at Conneaut, Ohio, has been appointed to superintendent of motive power, with headquarters at Cleveland, Ohio. Mr. Shortt was born at Crewe, Va., on December 9, 1888, and entered railway service as an apprentice on the Norfolk & Western at Crewe. From 1911 to 1914, he served as a machinist on the Atlantic Coast Line, the Norfolk & Southern and the Norfolk & Western. In 1914 he went with the Seaboard Air Line as a roundhouse foreman and in November, 1915, he returned to the Norfolk & Western as machinist and assistant foreman at Petersburg, Va. Mr. Shortt was promoted to roundhouse foreman at Portsmouth, Ohio, in 1920, and in November, 1923, he went with the Chesapeake & Ohio as machinist at Peach Creek, W. Va., later being advanced to foreman. He was transferred to Huntington, W. Va., in February, 1924, and appointed erecting shop foreman at Russell, Ky, on December 28, 1924. On June 1, 1930, he was appointed chief inspector at Lima, Ohio, and six months later he returned to Russell as erecting shop foreman. Mr. Shortt was appointed supervisor of reclamation, with headquarters at Huntington, on October 1, 1931, and a year later, he was appointed equipment inspector at Cleveland, Ohio. On July 16, 1933, he went with the Nickel Plate as assistant to the superintendent of motive power, with headquarters at Cleveland, and on December 1, 1937, he was appointed master mechanic of the Nickel Plate district, with headquarters at Conneaut, Ohio.

(*Turn to next page*)

Master Mechanics and Road Foremen

A. L. Plette, foreman on the Grand Rapids division of the Pennsylvania, has been appointed master mechanic of the western Pennsylvania division.

Harry L. Scheeler has been appointed assistant road foreman of engines of the Chesapeake & Ohio, with headquarters at Columbus, Ohio.

J. P. Kelly, works manager of the Ogden shops of the Canadian Pacific at Calgary, Alta., has been appointed master mechanic of the British Columbia district, with headquarters at Vancouver, B. C.

H. G. Nowell, master mechanic on the Canadian Pacific, British Columbia district, at Vancouver, B. C., has been transferred to the Saskatchewan district, with headquarters at Moose Jew, Sask.

Barry Glen, general shop and enginehouse foreman on the Chicago, Milwaukee, St. Paul & Pacific at Miles City, Mont., who has been appointed division master mechanic at Miles City, as noted in the June issue, was born on December 3, 1892, at Tacoma, Wash. After graduating from high school in Tacoma, Mr. Glen entered

Barry Glen

the service of the C. M. St. P. & P. on September 5, 1911, as a machinist apprentice. In October, 1915, he became a machinist at Tacoma; in May, 1919, enginehouse foreman at Cle Elum, Wash., and again a machinist at Tacoma in October, 1919. In December, 1922, he was appointed general shop and enginehouse foreman at Miles City. Mr. Glen was at the Baldwin Locomotive Works from March, 1922, to November, 1922, as an inspector of new power for the Milwaukee.

Car Department

C. E. Barrett has been appointed general car foreman of the Chicago, Milwaukee, St. Paul & Pacific at Minneapolis, Minn.

A. O. Taylor, gang foreman of the Renovo division of the Pennsylvania, has been appointed foreman of the Wheatland enginehouse and car shop at Wheatland, Pa.

E. Buchholtz, general car foreman of the Chicago, Milwaukee, St. Paul & Pacific at Minneapolis, Minn., has been transferred to Chicago.

A. C. Schroeder, general car department supervisor, Northern district of the Chicago, Milwaukee, St. Paul & Pacific, at Minneapolis, Minn., has been transferred to the Southern district, with headquarters at Chicago.

T. E. Anderson, general foreman of the car department of the Texas & Pacific at Marshall, Tex., has been appointed general car inspector, with headquarters at Dallas, Tex., temporarily in place of J. D. Clyde, Sr.

H. L. Ewing, general car foreman of the Chicago, Milwaukee, St. Paul & Pacific at Chicago, has become general car department supervisor, Northern district, with headquarters at Minneapolis, Minn.

F. J. Swanson, general car department supervisor, Southern district of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago has been granted a leave of absence to enter military service.

Shop and Enginehouse

C. B. Camp, erecting shop foreman on the Texas & Pacific with headquarters at Marshall, Tex., has been appointed general foreman at Dallas.

H. C. Vinsant, master mechanic on the Texas & Pacific at Marshall, Tex., has been appointed shop superintendent at Ft. Worth, Tex.

A. C. Malone, general foreman of the Hayne car shops of the Southern at Spartanburg, S. C., has been appointed superintendent of these shops, succeeding W. A. Harmon, deceased.

F. O. Fernstrom, shop superintendent of the Chicago, Milwaukee, St. Paul & Pacific at Minneapolis, Minn., has been transferred to the shops at Milwaukee, Wis., succeeding H. R. Abrahart, resigned.

H. E. Riccius, master mechanic of the Trans-Missouri division of the Chicago, Milwaukee, St. Paul & Pacific at Miles City, Mont., has been appointed shop superintendent, with headquarters at Minneapolis, Minn. His jurisdiction will include also the Twin City terminals and the Duluth division.

Notice!

Some of our friends among railroad men and those of affiliated interests, whose careers are outlined in "Who's Who in Railroading" (biographical volume issued by the Simmons-Boardman Publishing Corporation, publishers of the *Railway Mechanical Engineer*), have informed us that they have been circularized by a clipping bureau in New York, offering them a copy of what "Who's Who in Railroading" reports of their careers, at a price of $1.

This clipping bureau is in no way connected with the Simmons-Boardman Publishing Corporation. We make this statement because we have received a number of communications from our friends inquiring about the solicitation.

Purchasing and Stores

A. B. Sears, general foreman of the stores department of the Atchison, Topeka & Santa Fe at Topeka, Kans., has become assistant general storekeeper at Topeka.

Clifford G. Allen, purchasing agent of the Akron, Canton & Youngstown and the Northern Ohio, with headquarters at Akron, Ohio, has been promoted to chief purchases and stores officer, a change of title.

Obituary

G. B. Usherwood, supervisor of boilers of the New York Central System, with headquarters at Albany, New York, died in Albany on June 29.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

Everlasting Valves for Boiler Room Service.—Everlasting Valve Co., Jersey City, N. J. A 32-page descriptive catalogue of quick-operating valves for blow-off, water column and other boiler room service. Ask for Bulletin E-100.

◆

Carbide Tools.—McKenna Metals Co., 1000 Lloyd avenue, Latrobe, Pa. Forty-eight page booklet. Instructions, with illustrations, on selecting, designing, using, brazing, and grinding Kennametal steel-cutting carbide tools.

◆

Feedwater Heating Equipment.—Worthington Pump & Machinery Corporation, Harrison, N. J. Bulletin W-220-M5 showing representative installations of Worthington open type locomotive feedwater heating equipment on new power during 1939, 1940, and 1941.

◆

Rubber Conservation.—United States Rubber Company, Rockefeller Center, New York. Forty-eight page illustrated book, "First Aid to Industry in Conserving Rubber." Explicit suggestions given for the proper care of rubber products from their initial design through inventory and storage to use, maintenance, inspection and repair.

◆

Wall Cards On Care of Rubber Hose.—The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. Two 8¾-in. by 11-in. cards with eyelet for hanging—one devoted to the proper care of fire hose; the other to rules for the proper care of air, water, steam and other types of rubber hose and for proper attaching of couplings.

Railway Mechanical Engineer

August 1942

FOUNDED IN 1832

Published monthly by Simmons-Boardman Publishing Corporation, 1309 Noble Street, Philadelphia, Pa. Entered as second-class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, $3.00 for one year, U. S. and Canada. Single copies 35 cents. Vol. 116, No. 8.

RAILWAY MECHANICAL ENGINEER

Founded in 1832 as the American Rail-Road Journal

With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office.

Volume 116 — No. 8

Roy V. Wright
Editor, New York

C. B. Peck
Managing Editor, New York

E. L. Woodward
Western Editor, Chicago

H. C. Wilcox
Associate Editor, New York

J. L. Stover
Associate Editor, New York

Robert E. Thayer
Vice-Pres. and Business Manager, New York

AUGUST, 1942

Published on the second day of each month by

Simmons-Boardman Publishing Corporation

1309 Noble street, Philadelphia, Pa. Editorial and Executive Offices: 30 Church street, New York, and 105 West Adams street, Chicago. Branch offices: Terminal Tower, Cleveland; 1081 National Press bldg., Washington, D. C.; 1038 Henry bldg., Seattle, Wash.; 550 Montgomery street, Room 805-806, San Francisco, Calif.; 530 W. Sixth street, Los Angeles, Calif.

Samuel O. Dunn, *Chairman of Board, Chicago;* Henry Lee, *President, New York;* Roy V. Wright, *Vice-Pres. and Sec., New York;* Frederick H. Thompson, *Vice-Pres., Cleveland;* Elmer T. Howson, *Vice-Pres., Chicago;* Frederick C. Koch, *Vice-Pres., New York;* Robert E. Thayer, *Vice-Pres., New York;* H. A. Morrison, *Vice-Pres., Chicago;* John T. DeMott, *Treas. and Asst. Sec., New York.*

Subscriptions (including, when published, the daily editions of the Railway Age, published in connection with the convention of the Association of American Railroads, Mechanical Division), payable in advance and postage free, United States, U. S. possessions and Canada: 1 year, $3; 2 years, $5. Foreign countries, not including daily editions of the Railway Age: 1 year, $4; 2 years, $7. Single copies, 35 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.), and is indexed by the Industrial Arts Index and also by the Engineering Index Service. Printed in U. S. A.

Efficiency FOR Victory

The *Railway Mechanical Engineer* and its sister publications (Railway Age, Railway Engineering and Maintenance, Railway Electrical Engineer and Railway Signaling) have long been a principal means of informing the whole railroad industry of contributions toward efficiency and economy, wherever and however made. Now, for the duration, the effort of these publications will be concentrated on collecting and disseminating, in both their editorial and advertising pages, news of facilities and methods, wherever adopted, for producing more ton-miles and passenger-miles with the limited equipment, materials and labor force that will be available.

Our transportation editor will report currently from the "firing line" the innumerable things being done to increase the utilization and productivity of present plant . . . Our mechanical editors will recount the latest and best expedients adopted to put and keep the available supplies of locomotives and cars in the best practicable condition for the most efficient utilization . . . Our engineering and signaling editors will record the means being used to put and keep all permanent structures in condition to permit the most efficient utilization of equipment . . . Similar innovations and improvements in methods will be reported from all other railroad departments, including, of course, performance of the vital purchases and stores function, with accent on reclamation, conservation, substitution . . . Manufacturers of equipment and supplies will, in our advertising pages, contribute, as never before, information directed to helping the railroads to increase the service and prolong the life of the limited facilities that will be available, and to finding substitutes for materials heretofore used which have become largely or wholly unavailable.

In order that our railway papers may perform their part of the great task ahead as thoroughly and promptly as possible, we shall need the help of our readers. When something is done on your railroad that other railroads could do for the benefit of all, let us know about it. Our editorial staff is working intently to discover and report all important new developments as rapidly as possible—but obviously, the active collaboration of our thousands of railroad readers will enable us to do a more prompt and more effective job.

It is the hope of the railway publications of the Simmons-Boardman Publishing Corporation that they may efficiently serve all those pursuing the joint objectives of "Efficiency" and "Victory," the full and speedy attainment of which is so essential to our railroads and our country. And in furtherance of this objective we shall welcome all the information, ideas and suggestions from men in the railway field and the railway equipment and supply manufacturing field, the dissemination of which by these publications may be constructive "for the duration" and afterward.

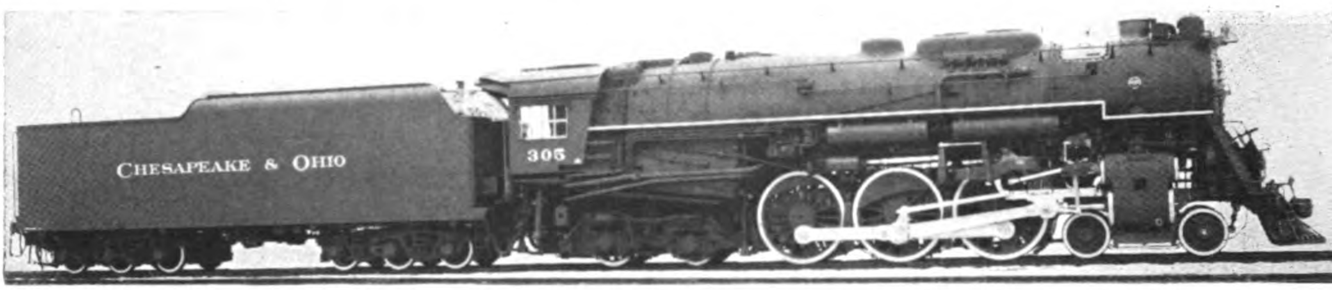
RAILWAY MECHANICAL ENGINEER
RAILWAY AGE
RAILWAY ENGINEERING AND MAINTENANCE
RAILWAY ELECTRICAL ENGINEER
RAILWAY SIGNALING

Chesapeake & Ohio Buys

4-6-4 Passenger Locomotives

Many parts of eight Baldwin-built engines fabricated by flame cutting and welding

DURING the early part of this year the Chesapeake & Ohio received eight passenger locomotives of the 4-6-4 type from the Baldwin Locomotive Works. These locomotives have 78-in. wheels and develop a tractive force of 52,000 lb., augmented by the booster to 64,600 lb. In many details the choice of materials and processes



of manufacture was influenced by difficulties in securing critical materials. Flame-cutting and welding were resorted to in fabricating numerous parts which ordinarily would have been cast or forged.

Boiler Plates Are Carbon Steel

The boilers are built of basic open-hearth steel for a working pressure of 255 lb. per sq. in. Firebox quality was used for all inside firebox sheets, including the two Thermic syphons and the back tube sheet, and for the outside throat sheet, the dome and dome cap. The thickness of the front barrel course is 1 in.; the conical course $1\frac{1}{16}$ in.; the third course, $1\frac{3}{32}$ in., and the throat sheet, 1 in. The thickness of the roof sheet is $1\frac{1}{16}$ in.; the side sheets, $\frac{5}{8}$ in., and the back head, $\frac{9}{16}$ in. The dome, although it is mounted on the conical shell course, is formed in a straight die, symmetrical about both horizontal and longitudinal axes.

The circumferential joint between the third shell course and the front wrapper sheet and between the shell course and the throat sheet is seal welded inside and outside. The outside butt strap on the third course is also seal welded in the stayed area over the combustion chamber. The joints between the roof and side wrapper sheets are located on the flat surface well below the level of the crown sheet and are butt welded in a single 60-deg. vee on the outside and back welded on the water side. These sheets are also seal welded on the outside at the throat-sheet seam and from the bottom up to the roof and side-sheet weld on the back-head seam.

There is a complete installation of Flannery flexible stays around the combustion chamber and on the throat sheet. They are applied at the breaking zones of the sides and in the two outside rows around the top and sides of the back head.

The mud ring is flame cut in four pieces from a $3\frac{1}{2}$-in. plate. The pieces are then joined by double-U butt welds. Furnace-bearer lugs are welded onto the bottom of the front and back pieces. One of the drawings shows how the patterns are laid out on the plate to reduce the waste to a minimum. After fabrication, these mud rings are finished all around both inside and outside and are secured in the firebox by a single row of rivets. The bottom edges of both inside and outside firebox sheets are flame cut to size and welded to the mud ring all around. Another part, which is flame cut, from plate, is the steam-pipe ring on the front tube sheet.

The ash pan is welded, except where parting is required for its removal. Ribs are welded on the outside to prevent warping. Both the ash-pan attachments to the mud ring and the Firebar grate side-frame supports are welded to the mud ring.

The boiler is laid out for a 52-unit Type E superheater with American throttle in the header. Boiler-feed equipment includes the Worthington type 5s feedwater heater and a Nathan horizontal high-pressure non-lifting injector rated at 9,000 gals. per hour. There is a Nathan low-water alarm with automatic cut-out valve. The coal is fired by a Standard modified MB stoker with the engine on the tender. The fire door is the Franklin butterfly type.

Cast-Steel Cylinders Are Bolted and Welded to Bar Frames

The foundation for the locomotive is a set of cast-steel bar frames, with separate cradle, furnished by the General Steel Castings Corporation. All frame braces are welded to the frames. The driving-box pedestal toes are unusually large longitudinally. The pedestal caps are held by two studs set in each toe and by a lock bolt at each end which passes down through the lower frame bar.

There are two cylinder and half-saddle steel castings These are bolted together, scarfed out, and then welded. The cylinder and frame joints and the saddle joint are also bolted and welded.

The back cylinder heads are separate castings, but are welded in place. The front valve-chamber heads are cast iron. Hunt-Spiller gun-iron bushings are applied in the cylinders and valve chambers.

The Running Gear

These locomotives have spoke driving wheels with shallow reinforcing flanges on the spokes at the inside with large radius fillets at the rim and hub. These wheels are mounted on axles with relief grooves at the inside edge of the wheel fit. The journals are fitted with Timken double-roller type bearings in two-piece housings.

Provision is made for a lateral of 3/16 in. on each side of the engine.

Both the engine and trailer trucks are Commonwealth types with Timken double-roller type bearings. Those on the engine truck are inboard and those on the trailer truck, outboard. The engine truck has 36-in. wheels. Its initial and constant lateral resistance is 30 per cent and the journal-box lateral is 3/16 in. A further instance of fabrication by welding is afforded by the engine-truck pedestal binders. These are fabricated by bending a flat steel bar to contour and welding on the pedestal lugs.

The trailer truck has 36-in. front wheels and 45-in. rear wheels. The front axle has a lateral movement of 1 in. and is fitted with the Timken three-roller lateral-motion device which provides a 10 per cent initial and constant resistance. The rear trailer axle has a lateral movement of 3/16 in. On this axle drives a Franklin Type E short cut-off booster with slip control.

The counterbalancing is based on static balancing in all driving wheels. In calculating the weights of the reciprocating parts the scale weights of the front and back ends of the main rod are used. Reciprocating weights are 2,207 lb. on each side, and a total of 820 lb. of overbalance is distributed, 250 lb. in each front and back wheel and 320 lb. in each main wheel. This leaves on each side an unbalanced reciprocating weight of 3.16 lb. per 1,000 lb. of locomotive weight.

Driving Gear

The pistons are cast steel, with Hunt-Spiller gun-iron bull rings, riveted on. The cylinder packing is the Hunt-Spiller duplex type with combination gun-iron and bronze rings. The crosshead is carbon cast steel of the multi-bearing type.

The crank pins are of open-hearth steel. All contain grease cavities fed through fittings on the outside ends of the pins. The side rods have pressed-in bronze bushings. The back end of the main rod has a bronze floating bushing working inside a pressed-in gun-iron bushing. Both the back end of the main rod and the side-rod middle connection have hard-grease fittings.

The piston valves are 14 in. in diameter and they have Hunt-Spiller gun-iron bull rings with duplex combination packing. The valve-rod crosshead was formed by flame cutting. Special attention was given to providing large steam passages. The dry pipe is 9½ in. and the steam pipes 8½ in. inside diameter.

The locomotive is equipped with the Baker valve gear with needle bearings on all pin connections and vulcanized red fibre liners for lateral wear. The reverse gear is the Franklin Precision Type F2 with 10-in. cylinders.

Spring Hangers Forged from Solid Stock

The double driving-spring hangers are symmetrical in form and are forged by drawing down the body from solid stock. No upsetting was permitted. The spring lugs are mostly made by welding a piece of bar stock of suitable diameter to the base of a piece of boiler-brace tee-iron. The stems of the tees were machined to fit the spring slots and the bar stock drilled to the size required to take the bushing. Pins and bushings are casehardened and have Alemite fittings.

The spring saddles are fabricated from 1¼-in. boiler plate, with spring-stop lugs welded on the top. These saddles have exceptionally long bearings on the top of the driving boxes.

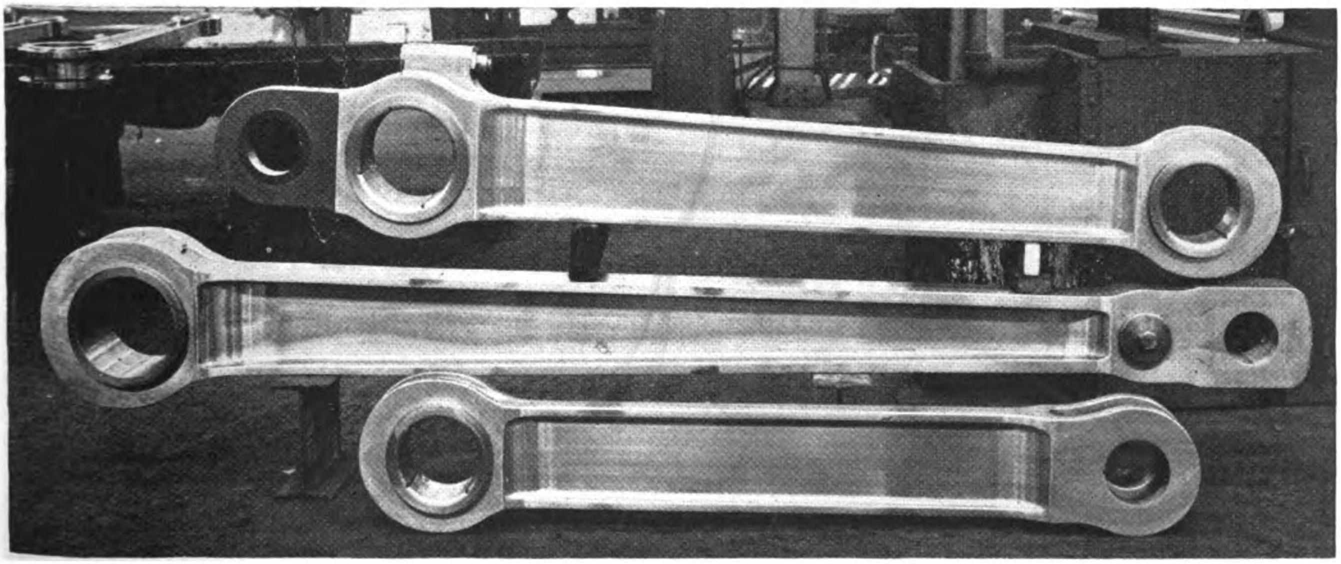
Lubrication

Each locomotive has two Nathan DV-7 36-pint mechanical lubricators. That on the right side supplies valve oil and that on the left, engine oil. The valve-oil lubricator has 13 single-pump feeds and, in addition to valve chambers and cylinders, furnishes lubrication to the guides and the hot-water pump. The engine-oil lubricator has eight single and four double pumps, feeding to the valve-rod crossheads, engine-truck center plate, trailer radius-bar seat, furnace-bearer shoes and radial buffer face, in addition to engine-truck, trailer-truck and driving-box pedestal faces.

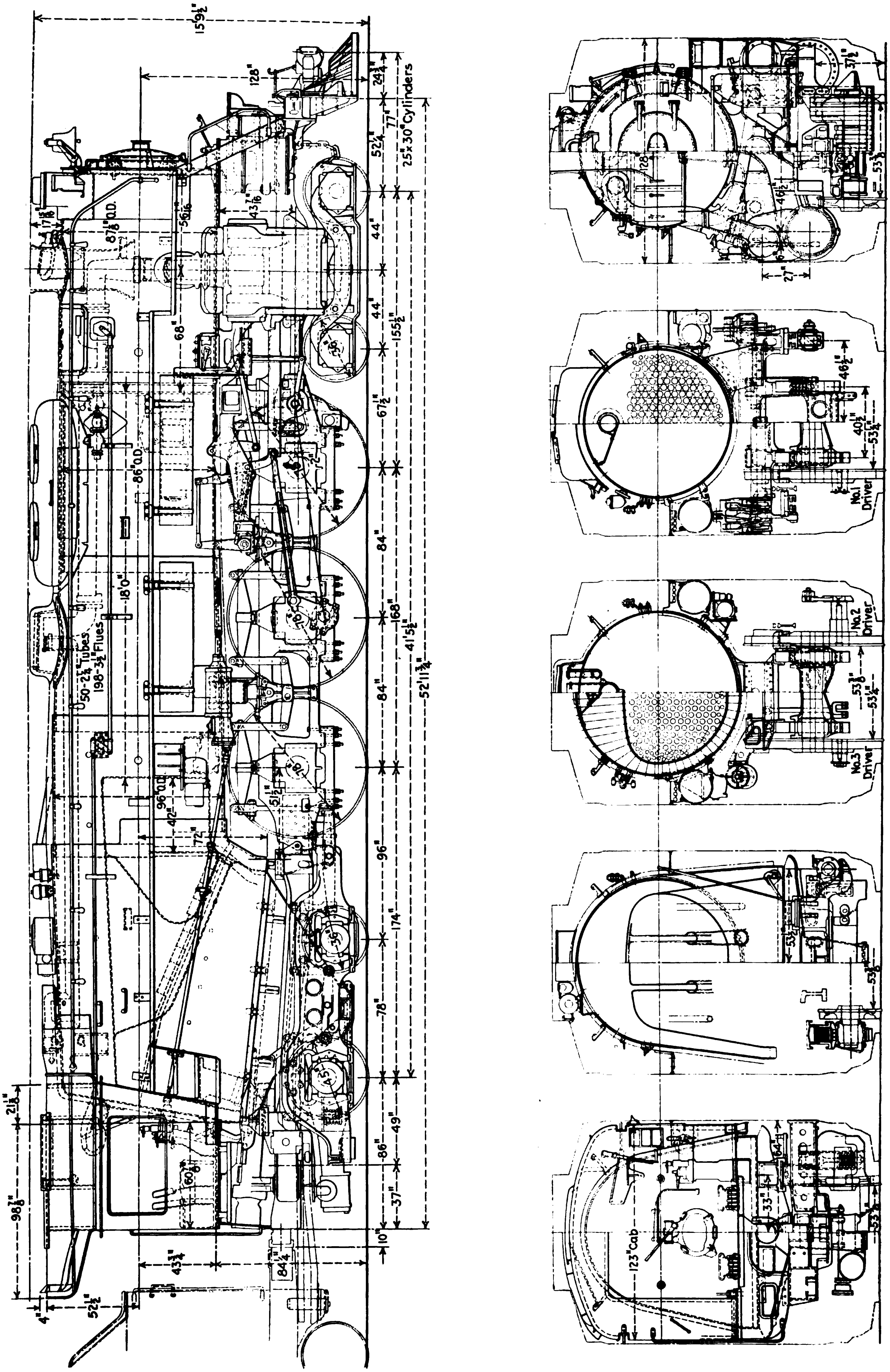
Grease lubrication through Alemite grease fittings is provided for the power reverse gear and reverse-shaft bearings, valve-motion bearings, spring-rigging and brake-hanger pins, throttle-rigging bearings, ash-pan dump-shaft bearings, the stoker gear case, engine- and trailer-truck lateral-motion devices, and the side-rod knuckle pins. Hard grease is used on the crank pins, crosshead wrist pins, and the back ends of the eccentric rods. The booster and the air-pump steam lines are fed from Edna automatic lubricators.

Boiler Fittings

Among the miscellaneous parts which were fabricated by cutting and welding are the throttle-lever fulcrum



The main and side rods



Elevation and cross-sections of the C. & O. 4-6-4 type passenger locomotive

bracket and the throttle compensating lever. Considerable ingenuity is reflected in the design of the hand-rail columns and boiler steps. These details are designed so that they may all be applied to the boiler with studs of a single length. Instead of using spacers to bring the base of the columns out to the surface of the jacket, the base is bolted directly against the boiler and is surrounded by a

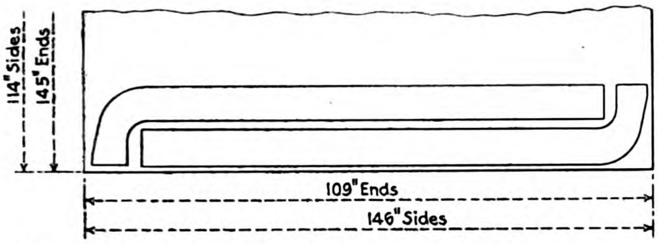
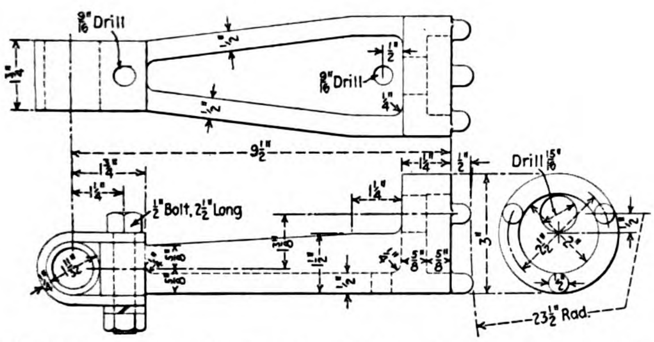


Plate sizes permit the flame cutting of mud-ring sections with a minimum of waste



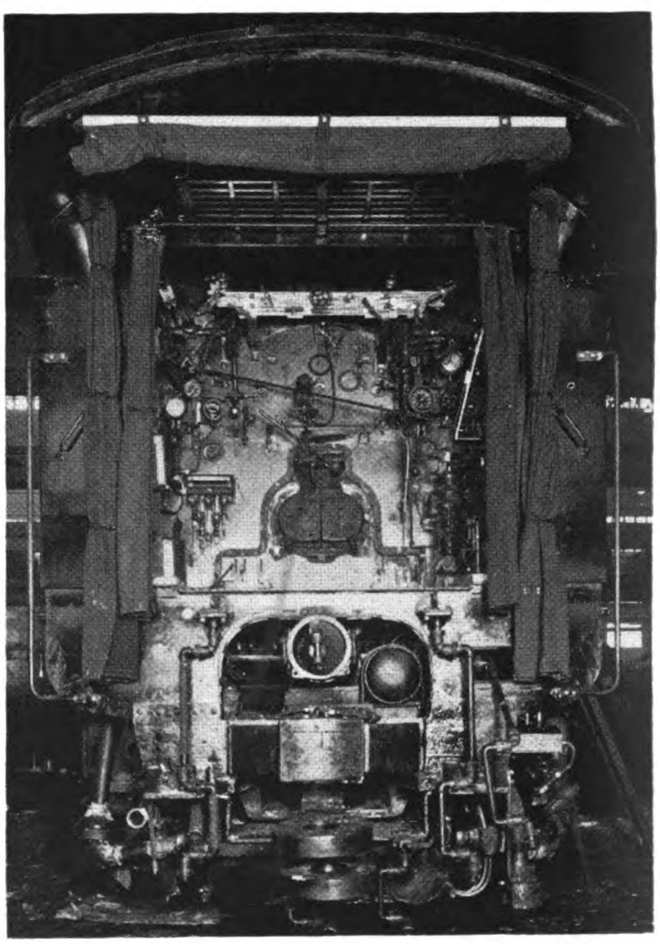
The handrail column, the base of which is bolted directly against the boiler shell, requires studs of but one length

lagging ferrule. On the base are three small projecting lugs which give the column a three-point support against the boiler. By reducing the length of one or more of these lugs on a grinding wheel, the column can be readily aligned, irrespective of the shape or angle of the surface against which it is bolted.

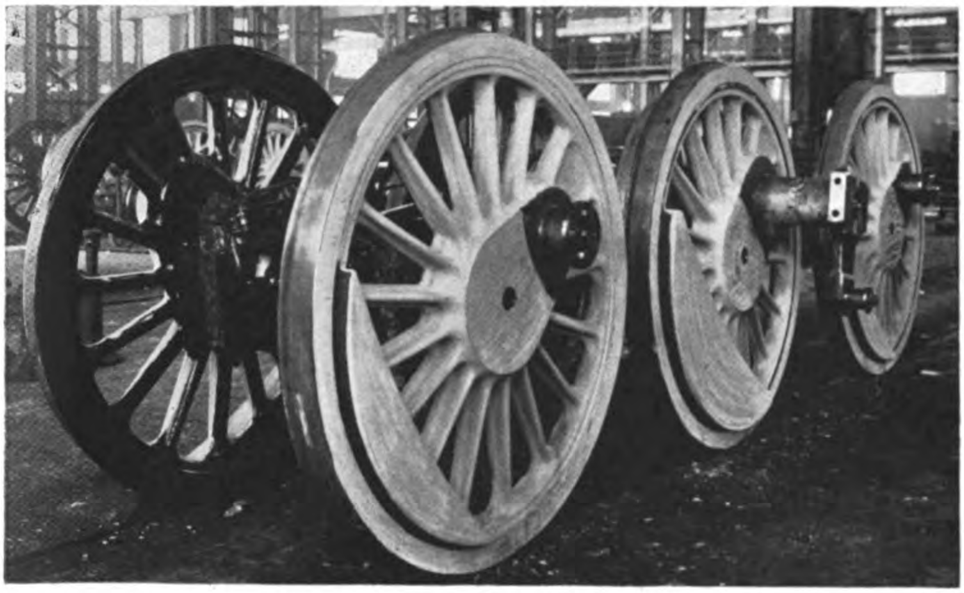
The locomotives have steel cabs fabricated by welding

General Dimensions, Weights, and Proportions of the Chesapeake & Ohio 4-6-4 Type Passenger Locomotive

Railroad	C. & O.
Builder	Baldwin
Type of locomotive	4-6-4
Road Class	L-2
Road numbers	300-307
Date built	1942
Service	Passenger
Dimensions:	
Height to top of stack, ft.-in.	15—9½
Height to center of boiler, ft.-in.	10—8
Width overall, in.	10—8
Cylinder centers, in.	93
Weights in working order, lb.:	
On drivers	217,500
On front truck	93,500
On trailing truck	128,500
Total engine	439,500
Tender	393,000
Wheel bases, ft.-in.:	
Driving	14—0
Rigid	14—0
Engine, total	41—5½
Engine and tender, total	91—8¼
Wheels, diameter outside tires, in.:	
Driving	78
Front truck	36
Trailing truck:	
Front	36
Rear	45
Engine:	
Cylinders, number, diameter and stroke, in.	2—25 x 30
Valve gear, type	Baker
Valves, piston type, size, in.	14
Maximum travel, in.	8
Steam lap, in.	1⅜
Exhaust clearance, in.	5/16
Lead, in.	5/16
Boiler:	
Type	Conical
Steam pressure, lb. per sq. in.	255
Diameter, first ring, inside, in.	84
Diameter, largest, outside, in.	96
Firebox length, in.	135 1/16
Firebox width, in.	96⅛
Height mud ring to crown sheet, back, in.	69¼
Height mud ring to crown sheet, front, in.	92¼
Combustion chamber length, in.	42
Arch tubes, number and diameter, in.	2—3½
Thermic syphons, number	2
Tubes, number and diameter, in.	50—2¼
Flues, number and diameter, in.	198—3½
Length over tube sheets, ft.-in.	18—0
Net gas area through tubes and flues, sq. ft.	9.22
Fuel	Bit coal
Grate area, sq. ft.	90
Heating surfaces, sq. ft.:	
Firebox and comb. chamber	345
Arch tubes	19
Thermic syphons	96
Firebox, total	460
Tubes and flues	3,773
Evaporative, total	4,233
Superheater	1,810
Comb. evaporative and superheater	6,043
Tender:	
Type	Water bottom
Water capacity, gals.	21,000
Fuel capacity, tons	30
Trucks	6-wheel
Journals, diameter, in.	7-roller bearing
Rated tractive force, engine, lb.	52,000

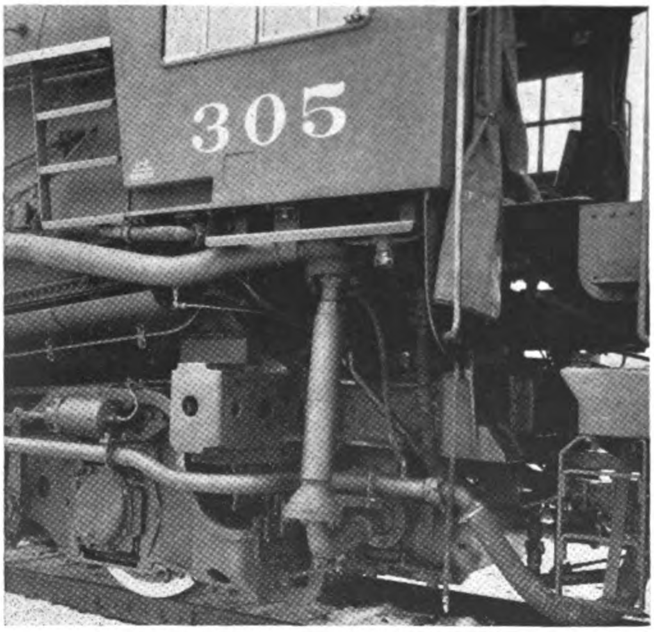


Rear end of the locomotive showing the engine and tender connections



The driving wheels are the spoke type with reinforcing ribs—The Timken double-roller type journal bearings have two-piece housings

Rated tractive force, booster	12,600
Total rated tractive force, lb.	64,600
Weight proportions:	
Weight on drivers ÷ weight engine, per cent	49.48
Weight on drivers ÷ tractive force	4.18
Weight of engine ÷ evaporative heating surface	103.82
Weight of engine ÷ comb. heating surface	72.72
Boiler proportions:	
Firebox heating surface, per cent comb. heating surface	7.61
Tube-flue heating surface, per cent comb. heating surface	62.43
Superheater heating surface, per cent comb. heating surface	29.95
Firebox heating surface ÷ grate area	5.11
Tube-flue heating surface ÷ grate area	41.92
Superheater heating surface ÷ grate area	20.11
Combined heating surface ÷ grate area	67.14



Pipe connections under the left side of the cab

Gas area, tube-flues, per cent of grate area	10.24
Evaporative heating surface ÷ grate area	47.03
Tractive force ÷ grate area	577.78
Tractive force ÷ evaporative heating surface	12.28
Tractive force ÷ comb. heating surface	8.60
Tractive force x diameter drivers ÷ comb. heating surface	671.19

and are fitted with Edwards brass sash. Running boards are steel with diamond pattern treads. Superheated steam is supplied to the blower and whistle. All other auxiliaries receive saturated steam. The blower valve, the stoker-engine throttle, and the feedwater-pump throttle are Lunkenheimer valves with stainless-steel stems and nickel-alloy seats and discs.

Tender

The tender tanks are built on a General Steel Castings water-bottom under-frame and are of riveted construction throughout. The coal-space sheets and the tank top are of copper-bearing steel. The remainder of the tank plates are of carbon steel. The water filling hole is placed longitudinally instead of transversely in the roof of the tank. It is 192 in. long by 18 in. wide.

The tender trucks are the Buckeye six-wheel type with multi-wear rolled-steel wheels 36 in. in diameter. The wheel base is 10 ft. The axles have 7-in. journals fitted with Timken double-roller type outboard-bearing boxes. Each bolster-spring set includes a Cardwell-Westinghouse snubber. Truck brakes are the Simplex class type.

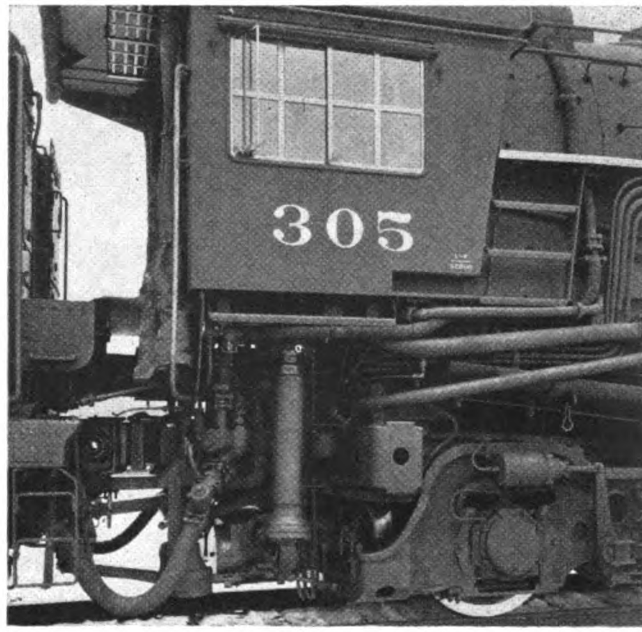
Partial List of Materials and Equipment on the Chesapeake & Ohio 4-6-4 Type Passenger Locomotives

Frames and cradles; engine and trailer trucks	General Steel Castings Corp., Eddystone, Pa.
Wheels and axles	Standard Steel Works Division of the Baldwin Locomotive Works, Philadelphia, Pa.
Tires	American Locomotive Co., Railway Steel Spring Div., New York
Crank pins	Camden Forge Co., Camden, N. J.
Roller bearings; lateral motion device	The Timken Roller Bearing Co., Canton, Ohio
Semi-elliptic and coil springs	Pittsburgh Spring & Steel Co., Pittsburgh, Pa.
Snubber springs	Cardwell Westinghouse Co., Chicago
Bumper	Ohio Steel Foundry Co., Lima, Ohio
Coupler pilot	National Malleable and Steel Castings Co., Cleveland, Ohio
Uncoupling rigging	Standard Railway Equipment Company, Chicago
Pilot coupler pocket	Symington Gould Corp., Rochester, N. Y.
Drawbar; safety bar; pins	Ewald Iron Co., Louisville, Ky.
Radial buffer; booster	Franklin Railway Supply Co., Inc., New York
Rerailer	American Chain & Cable Company, Inc., New York
Air brakes	New York Air Brake Co., Watertown, N. Y.
Flexible connections to air reservoirs, steam supply to air pump, in air line between distributing valve and reservoir, air line to reverse cylinder	Barco Manufacturing Co., Chicago
Air gage	Ashton Valve Co., Boston, Mass.
Cylinders	General Steel Castings Corp., Eddystone, Pa.
Reverse gear	Franklin Railway Supply Co., Inc., New York
Crossheads	Ohio Steel Foundry Co., Lima, Ohio
Rod bushings	Magnus Metal Div., National Lead Co., New York
Valve gear	Pilliod Co., New York
Valve extension handle universal joints	Manning, Maxwell & Moore, Inc., Locomotive Equipment Division, Bridgeport, Conn.
Piston-rod and valve-stem packing	T-Z Railway Equipment Co., Chicago
Drain cocks	Barco Manufacturing Co., Chicago
Gaskets	The Garlock Packing Company, Palmyra, N. Y.
Piston bull rings; cylinder and steam-chest bushings; back-end main-rod bushings; piston and piston-valve packing	Hunt-Spiller Manufacturing Corporation, Boston, Mass.

Mechanical lubricators	Nathan Manufacturing Co., New York
Automatic lubricators, booster and air pump	Edna Brass Mfg. Co., Cincinnati, Ohio
Alemite fittings	The Prime Manufacturing Co., Milwaukee, Wis.
Boiler and firebox steel	Lukens Steel Co., Coatesville, Pa.
Smokebox front	The Okadee Company, Chicago
Smokebox netting	The W. S. Tyler Co., Cleveland, Ohio
Arch brick	American Arch Co., Inc., New York
Syphons	Locomotive Firebox Co., Chicago
Arch tubes; boiler tubes; flues	(2) The Babcock & Wilcox Tube Co., Beaver Falls, Pa. (6) National Tube Co., Pittsburgh, Pa.
Staybolt iron	Ewald Iron Co., Louisville, Ky. Old Dominion Iron & Steel Works, Inc., Richmond, Va.
Staybolts-Flexible, flexible expansion and hollow rigid	Flannery Bolt Co., Bridgeville, Pa.
Boiler and firebox rivets	The Champion Rivet Co., Cleveland, Ohio
Boiler braces; pins	Ewald Iron Co., Louisville, Ky.
Superheater; superheater header throttle	The Superheater Company, New York
Superheated-steam-line shut-off valve	Crane Co., Chicago
Throttle	American Throttle Co., New York
Lagging	Johns-Manville Sales Corp., New York
Pipe covering	Union Asbestos & Rubber Co., Chicago
Pipe, iron	A. M. Byers Co., Pittsburgh, Pa.
Pipe clamps—tender	Illinois Railway Equipment, Chicago
Feedwater heater	Worthington Pump and Machinery Corp., Harrison, N. J.
Injectors; boiler checks; low water alarm	Nathan Manufacturing Co., New York
Washout plugs	Huron Mfg. Co., Detroit, Mich. American Locomotive Co., New York
Blower valves; stoker engine throttle; feed pump throttle	The Lumkenheimer Company, Cincinnati, Ohio
Blow-off cocks; muffler; cylinder cocks	The Okadee Company, Chicago, Ill.
Smokebox blower fittings	Barco Manufacturing Co., Chicago
Stoker	Standard Stoker Co., Inc., New York
Fire doors	Franklin Railway Supply Co., Inc., New York
Grates	Waugh Equipment Co., New York
Hose strainer	T-Z Railway Equipment Co., Chicago
Cab curtains	The Lehon Co., Chicago
Cab sash	The O. M. Edwards Co., Inc., Syracuse, N. Y.
Windshields; clear-vision windows	The Prime Manufacturing Co., Milwaukee, Wis.
Running boards	Alan Wood Steel Co., Conshohocken, Pa.
Safety valves; steam and back-pressure gages	Manning, Maxwell & Moore, Inc., Locomotive Equipment Division, Bridgeport, Conn.
Globe and angle valves	American Radiator Co., New York
Turret valves; water-column gages; gage cocks; rail washers	Nathan Manufacturing Co., New York
Steam-heat gage	Ashton Valve Co., Boston, Mass.
Steam-heat regulators	Gold Car Heating & Lighting Co., Brookyln, N. Y.
Suction hose	Hewitt Rubber Corp., Buffalo, N. Y.
Sanders	Viloco Railway Equipment Co., Chicago
Headlight generators	The Pyle-National Company, Chicago
Flexible connections steam line to head light generator	Barco Manufacturing Co., Chicago
Bell ringer	Superior Railway Products Corp., Pittsburgh, Pa.
Speed recorder	General Electric Company, Schenectady, N. Y.
Whistle	Nathan Manufacturing Co., New York
Whistle valve and cylinder	Viloco Railway Equipment Co., Chicago
Flexible connections, misc.	Barco Manufacturing Co., Chicago
Flexible connections between engine and tender	Franklin Railway Supply Co. Inc., New York
Rear uncoupling arrangement	Standard Railway Equipment Company, Chicago

Tender:

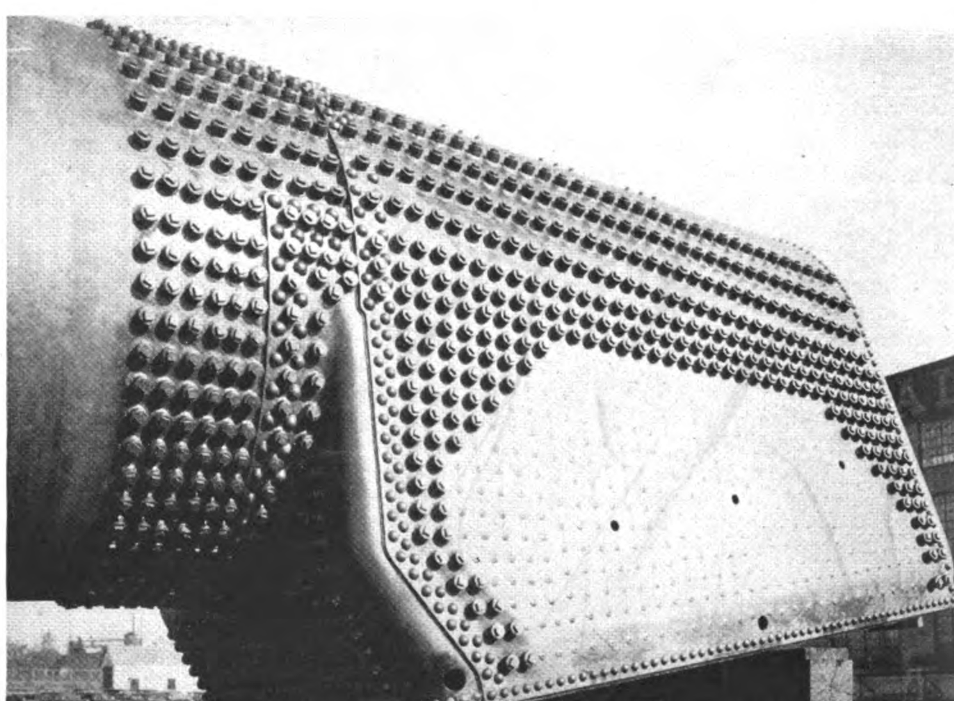
Frame	General Steel Castings Corp., Eddystone, Pa.
Frame plugs	Huron Mfg. Co., Detroit, Mich.
Trucks	Buckeye Steel Castings Co., Columbus, Ohio
Wheels	Standard Steel Works Division of the Baldwin Locomotive Works, Philadelphia, Pa.
Axles	American Locomotive Co., New York
Roller bearings	The Timken Roller Bearing Co., Canton, Ohio
Coupler; draft-gear yoke	National Malleable and Steel Castings Co., Cleveland, Ohio
Brakes, clasp	American Steel Foundries, Chicago
Draft gear	W. H. Miner, Inc., Chicago
Tank steel	Lukens Steel Co., Coatesville, Pa.
Tank valves	Wm. Powell Co., Cincinnati, Ohio



Engine and tender connections from the right side

McLaughlin flexible connections are installed between the engine and tender for air and steam. Barco connections are inserted in air lines at the air compressors, main-reservoir connections, in the line between the distributing valve and main reservoir, and at the reverse-gear cylinder. They are inserted in steam lines to the air compressors and headlight generator. The engine and tender connections include Ewald-iron drawbar, safety bar and drawbar pins, with Franklin E2 type buffers.

The roof and side wrapper sheets are joined by butt welding—The throat-sheet and side-sheet seams are seal welded



Symington's

War Production Drive*

One of the posters featuring a committee member—The appeals are intimate—Note his signature

By C. J. Symington†

Unique methods, dominated by a spirit of sincerity, bring results

We have had an interesting and gratifying experience these past several weeks. We have seen a labor-management production drive committee come into being and go to work in one of our plants. Even though it has been functioning less than three months we believe the basic idea is a workable means of materially assisting in the production of the many materials needed for the war effort.

When the war production drive idea, with its labor-management committee, was first broached by the government, we, doubtless like many others, were somewhat skeptical of its workability. On the other hand, we were aware of the necessity for increasing our production of war materials. Our labor situation was stable under a "union shop" contract. We could not find any tenable reason why the labor-management production drive committee idea should not be given a trial. Try it we did.

Our first step was to reach an understanding with the representatives of our employees' union to the effect that the labor-management committee idea dealt only with matters relating to *more production;* that matters ordinarily coming within the field of our contract with the union could not and would not be the business of the labor-management production drive committee. With this understanding reached the union was requested to designate eight member employees for service on the production drive committee, four as committeemen and four to serve as alternates. Management then designated eight employees from the supervisory force, four of whom serve as committeemen and four as alternates. The general manager of the plant has acted as chairman and the manager of industrial relations as vice-chairman.

Management had no voice, suggestive or otherwise, in the selection of the labor members of the Committee. In selecting management members care was taken to designate supervisors who stood high in the opinion of our labor ranks.

Sincerity the Keystone

In the process of forming the committee and during its early meetings there developed what we believe to be the keystone of the whole labor-management committee plan—*sincerity*. All concerned soon realized (and expressed themselves accordingly) that unless there was confidence in the sincerity of the members, one to another, there could be nothing constructive resulting from the committee's labors. Also if the committee as a whole, or any of its members, could not feel confident in the sincerity of management (or vice versa) the trial would result in failure.

From the outset, the committee realized that its efforts could not result in success unless the plant personnel could be encouraged to take an active part in the program. As a windfall in this direction, at about the time the committee had started on its work, we were able to arrange to have an army tank driven into the plant. This afforded the men an opportunity to see where and how the steel castings they were making were assembled into fighting machines. The interest of the personnel was intense. The men were all around the tank pointing out where the particular castings they worked on were used. This incident proved a worthwhile demonstration and seemed to bring to the men graphically a realization that they were in fact a part of the great war production effort. The committee was alert to capitalize this quickening of interest and they

---

* An address before the War Conference of the National Industrial Advertisers Association, Atlantic City, N. J., June 26, 1942.
† President, The Symington-Gould Corporation.

used this incident as a setting for subsequent moves in arousing and holding the interest of the personnel.

Suggestion Boxes Installed

The suggestion box idea was the next move of the committee. Suggestion boxes were installed in each department of the plant and the men encouraged by bulletin board notice and other plant publicity methods to submit ideas for the purpose of improving the quantity and quality of our production. To further this idea, management appropriated a sum to be awarded monthly for suggestions considered by the committee to have merit. The awards were to be made in the form of war bonds and war stamps. The committee was to be sole judge of the practicability and value of all suggestions submitted and be completely responsible for all awards. In the working out of the first series of awards the committee was solicitous in asking the opinion of management respecting the many suggestions submitted. The opinion of management, however, was not controlling but was merely advisory. The final decision remained with the committee.

Realizing and appreciating the value of advertising technique, the committee looked about for promotional posters that would aid the effort. To further this phase, management made available to the committee public relations and advertising consultants to whip the ideas of the promotional campaign posters evolved within the committee into practicable and workable shape. You may be interested to hear the attitude of the committee toward the poster question in general. They were unanimous in their opinion that the posters be kept on the serious side and rather than ridicule our enemies that the posters stress the part being played by the *war production army,* in backing up the *fighting army.* As one member of the committee expressed it—"It is rather silly to make faces at someone who is hitting you on the chin."

Posters Personalized

Another idea developed within the committee was to personalize the posters and advertising material, that is, to bring into these posters the faces and scenes with which our own men were familiar. A series of posters embodying this idea are now in work. There will be eight. The upper pictures which are done in one color are actual photographs taken in the eight major departments in the plant with drawings of battle scenes to dramatize to the men how important their contribution and work is toward the ultimate goal of winning the war.

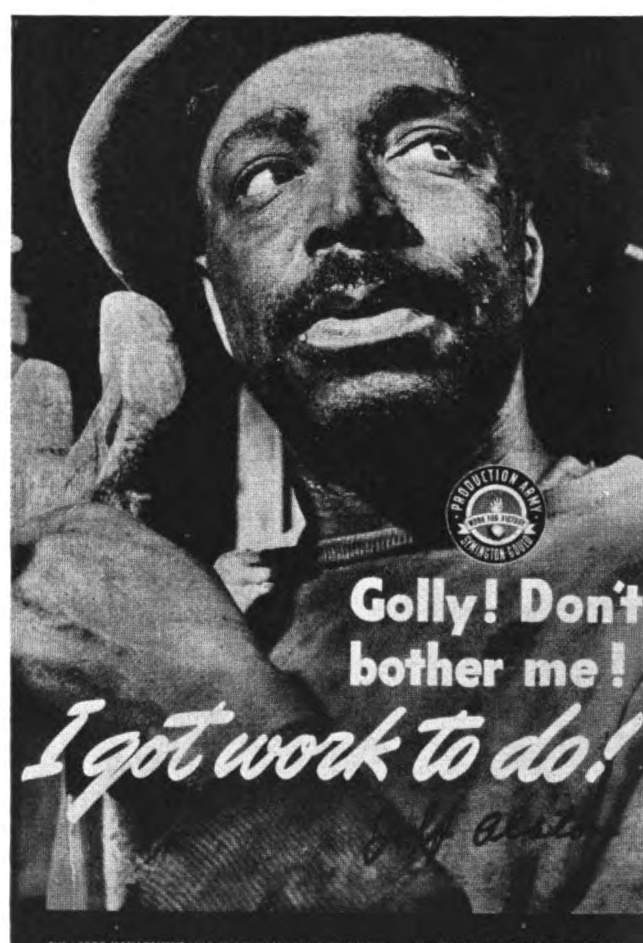
Another series of eight posters has been designed around the four labor members of the committee and the four labor alternates. Signed photographs of these eight men with appropriate captions, chosen by the committee, will be displayed on the various departmental bulletin boards.

In the development we, of course, have encountered recommendations by the committee which under ordinary conditions we would not be inclined to carry out. We have, however, had the courage to permit the committee to go ahead and make its mistakes with the result that the committee is becoming more careful, more thoughtful, and the mistakes are becoming fewer. In any experiment of this kind the acid test is—Will it work in practice? I can say to you today that it has worked with us.

Production Increased Greatly

During the month of May our workers contributed 230 suggestions, 80 of which were put into practice and 80 prizes were duly awarded. The top prize of a $100.00 war bond went to an employee whose suggested method of checking patterns is definitely increasing the efficiency of his department; a special prize was awarded to a worker who wrote an inspiring poem which the committee is using as a basic theme for a poster; all of the other suggestions for which awards were made are of definite practical value to the company in its production efforts. We cannot do less than give the suggestion box of the labor-management committee credit for bringing them to light.

Now, the all important business of increasing production. You will be interested to know that within 30 days after the drive was launched (and this was before plant posters and other means of stimulating interest had been brought into play) our production jumped 14 percent in volume and the output per man hour increased 8¾ percent. In order that every employee may know currently how the plant is producing throughout a week, a large production chart or target has been erected directly inside the main gate where everyone entering the plant may see it. The huge target is flanked on either side by the soldier on the fighting front on the left, and the production soldier on the right. Incidentally, the production soldier is one of our own men. The general theme symbolizes the importance of complete support for the men on the firing line. The target provides the scale on which daily production progress is displayed. The trajectory of the tracer bullet being fired from this gun is lighted to indicate production for the week.



Poster showing one of the workers in the plant, and reflecting his attitude

Bulletin board near entrance to plant identifying the armor castings made by Symington-Gould

Donald Nelson, in inaugurating the war production drive, indicated the necessity and desire of the government for an increase of 25 per cent in production. Our committee has set its goal at 40 per cent increase over what the production of the plant was before the drive got under way. The committee realizes that this goal will not be reached, except with the aid of additional facilities, some of which are now in course of installation. We are confident, however, that the efforts of the committee will result in our obtaining the maximum production from our facilities and our man-power.

To emphasize the importance of the production chart, the committee staged a rather elaborate but singularly impressive unveiling ceremony. The War Production Board in Washington was represented, as was the Rochester Ordnance District, the city government and United Steel Workers of America. Ray Millholland, chief, Technical Unit, War Production Drive Headquarters, was the principal speaker and prizes for suggestions were given out by City Councilman Frank E. Van Lare. It was a most impressive demonstration and extremely effective in adding to the enthusiasm of the workers.

Post-War Possibilities

And now, in closing, may I leave one thought with you which may be worth exploring? In doing so I do not wish to take away any of the emphasis we must continue to put on the war effort. It has been well said that we should not waste time and energy in developing what kind of peace we will make, or what problems we must face in the post-war readjustment until *after* we have won the war. *But,* if it can be definitely proven that in the melting pot of actual practice during the war, the labor-management committee plan of the War Production Drive Headquarters has been responsible for a real improvement in labor relations and instrumental in stepping up production during the war period, is it not possible that the same basic idea of a partnership—labor, management and government—in the spirit of wholehearted cooperation, will be the means of solving a great many of the problems to arise in the inevitable post-war readjustment?

* * *

How Cooperative Plan Works

By Charles F. Maw*

Type of problems considered at each meeting—Safety rules devised as the result of such conferences

THE emergency confronting us as a nation should bring home to every American citizen the urgent necessity of prompt, methodical and continued application to duty. Whether our responsibilities in the sphere of life in which we move be great, or not so great, we should do our best.

On the first Tuesday morning of each month representatives of the mechanical department assemble in my office. The various assistant foremen and the representatives of the various crafts attend. The stores department and the transportation department are also represented. This is known as the Co-operative Plan.

Program for Co-operative Meetings

Approximately 45 minutes is the allotted time for these meetings. The value derived from the discussions and suggestions cannot be estimated in dollars. The agenda for each meeting is prepared beforehand by the secretary, who is chief clerk in the local mechanical-department office, and usually consists of the following items:

1—Suggestions for improved efficiency in operation. Time is valuable.

2—Recommendations for expediting repair work by approved short-cut methods, and testing out, after a check-up of suggested economical time- or labor-saving operations.

3—Conservation of material. This is a vital factor at this time, and is discussed in two sections.

(a) Stocks to be kept to the minimum with careful regard for the requirements by reason of anticipated business. Extreme stock reduction, with a possibility of jeopardizing operations, is discouraged, as also is overstocking, which would tie up useful materials so necessary to railroad operations at other points.

(b) Salvaging and reclamation of second-hand and scrap material. Good judgment and proper supervision frequently bring remarkable results. Here is an example. An engine is on the drop pit and rod bushings are being changed as required. The bore of the bushings removed has reached the point where it exceeds the diameter of the pins by the limits allowable, yet the bushings are not otherwise in condition to be discarded. They are carefully gone over; a light cut on the outer circumference, together with a similar operation inside the bore may place these bushings in serviceable condition for a rod or pin of another locomotive. Valuable time and material are thus saved.

4—Safety First. The following pledge hangs on the office wall: "I will railroad according to the Book of Rules. I will do all in my power to guard against unsafe acts on my part. If I see a fellow employee doing his work in an unsafe manner, I will speak to him as a friend, and use my moral influence to have him perform his duties in the safest possible manner. I will remember and practice at all times safety first."

The list of personal injuries sustained by employees in the district in which this terminal is located and included, is carefully read and discussions as to the cause are encouraged. Where carelessness is apparent, the person is interviewed and cautioned by myself and also by representatives of the employees. Usually this brings about a correction. The man who loses a leg, or an arm, or an eye, or in some manner becomes less than normal in his working capacity, is to the extent of his disability putting a brake on transportation or industry, or perhaps both. Never in the history of our country was man-power more important.

5—Fire Prevention. This is a live question at the moment. Property destroyed by a fire is a positive and irreplaceable loss. Fire extinguishers of the portable type are checked at frequent intervals and records kept. The premises are kept entirely free of all accumulations of combustible refuse such as old waste, shavings, etc. The pipes from stoves and heaters are periodically checked and replaced as required. Clothes lockers, tool boxes, storage closets and cupboards are inspected from time to time and must be kept neat and clean. A well-equipped fire brigade is maintained, consisting of members of the staff, trained in the use of the equipment.

The storage of lumber, wood, oil, waste and like commodities is carefully planned and watched daily. Portable extinguishers and pails of sand are placed convenient for emergency. Fuses and torpedoes are kept in fireproof cabinets. Electric wiring and fixtures are inspected frequently and corrections made by qualified men. Grounds and short circuits are dangerous and expensive.

6—At this place on the program cooperation is stressed, particularly in regard to the war effort. The urgent necessity for the care of rubber hose and other like materials is urged. The purchase of Defense Bonds and Stamps is recommended and encouraged.

Accident Prevention Suggestions

So far as safety first is concerned, we must remember that 60 per cent of the accidents occurring daily on the railroads can be avoided if proper and reasonable care is taken. Here are safety rules applicable to the mechanical department that have been developed as a result of the Cooperative Plan:

1—Don't climb over couplers between cars, and never pass beneath a car. It may be moved quite unexpectedly.

2—If necessary to cross tracks or yards, look in all directions before so doing.

3—Never step from one track to another without being positive you are safe—"Look before you leap."

4—No matter how insignificant your job may seem, do it well. Keep your mind on your work. If your mind wanders you may lose a finger or a hand, or worse.

5—Don't violate rule "G." Think of the other fellow whose

* Locomotive Foreman, Canadian National-Grand Trunk Lines in New England, Island Pond, Vt.

life may be endangered along with your own. Take your proper rest.

6—Never pass immediately in front of or behind engines or cars, or between them when standing close together. You may get caught.

7—Don't attempt to operate a machine unless you are fully qualified. Never operate a machine unless instructed by your foreman.

8—Use great care when shifting belts by hand when machine is in motion. Preferably use a guide stick or stop the machine.

9—Never remove guards from a machine for convenience sake. Keep them in their proper position.

10—When finished with machine leave all guards in proper position. Think of the other fellow.

11—Never step upon the front footboard of a moving engine, or the front side step of a moving caboose or coach. It is dangerous.

12—Keep clear of escaping steam. You may collide with some object obscured from view by the steam, or walk into a pit.

13—Never fool with torpedoes.

14—Remember the clearance is limited between roundhouse doors and engines moving in and out of the shop. Don't ride on side steps.

15—When lifting material act in unison, both in taking hold and letting go.

16—Never use a scaffold, horse, ladder or any other support without testing it carefully.

17—Exercise every care that no person is passing below when it becomes necessary to drop tools or material from above, and warn in advance.

18—Never leave tools or other material overhead on scaffold or swing planks when you have finished your job.

19—Never pass under a load being transferred by hoist, crane, or other mechanism.

20—Never cut off the heads of bolts and rivets unless flying heads are protected against by a broom or bagging, or other safety device.

21—When using cutting or welding torch, always protect yourself with proper goggles.

22—Never use the emery wheel without using goggles—and if you see a fellow worker attempt this, call it to his attention.

23—Replace all covers on drop pits, manholes, etc., when you have finished working.

24—Never clean or oil machinery when it is in motion.

25—Never work with a defective tool; return it to the toolroom or show it to your foreman.

26—Never file right handed on the lathe. You are too close to the chuck.

27—Never stand in front of the steam hammer to handle material. Stand at the side and use tongs.

28—Never wear long, loose or baggy sleeves around revolving machinery.

29—Always block the wheels on a car or loose tender before jacking up.

30—Use regular jack handles. Small bars or pieces of pipe are dangerous on account of slipping.

31—Never move an engine before ringing the bell and going around it. Someone may be working on or beneath it.

32—Never make an application of the brakes on an engine without first finding out if anyone is working on it; you may cut off someone's finger.

33—Never uncouple an air hose on cars or between two locomotives without first closing angle-cocks.

34—Never leave draw-bars, couplers, material of any kind or tools where they may be a source of danger by people falling over them.

35—Never carelessly throw down boards with protruding nails. The nails should be bent over, or at least the point turned downward.

36—Don't stand between moving cars to make a coupling, and never use your feet or hands to adjust the coupler; you may lose a foot or hand.

37—When your duty calls you to ride a car for the purpose of receiving and displaying signals, or for operating the hand brake, place yourself in a safe position. Don't ride the brake wheel or sit on the end of the car. Also keep clear of exceptionally high cars unless unavoidable, and then keep a sharp lookout for overpass, bridges, etc.

38—Never lean out of a cab window or ride the side of a car before noting if there is sufficient clearance.

39—Always place reverse gear in central position. Set the brakes and open cylinder cocks before leaving a locomotive.

40—Pile material well and neatly and be positive that it will not fall.

41—Never ride on a journal box, brake rigging, truss rods or other unsafe footing. If your duties call you to ride, use the proper safety appliances.

42—Never enter a room or car containing inflammable material of any description with a lamp. This is dangerous.

43—Always be sure before closing car doors, firebox doors or replacing manhole covers or container covers that no one is inside.

44—Never overload tenders. Falling coal is dangerous and an expensive waste.

45—When passing a station or public thoroughfare, never open cylinder cocks. You may scald someone or scarce horses, with serious results.

46—Pieces of hardened steel or files should never be used for drift pins.

47—Before mounting a ladder see that it is safely secured against slipping.

48—Never ride on a planer bed.

49—Unless your duties so require, don't touch electric wires or apparatus. If it is your duty to do so, be positive you have the correct tools and that they are in good condition.

50—It is dangerous to put your fingers under material to find if drill is coming through.

51—Never attempt to tighten arch tube, washout or other plugs under pressure. Consult foreman.

52—It is dangerous to pass under or near bar material being turned in turret lathe.

53—Keep gears covered; exposing is dangerous.

54—Before you swing a sledge, look around. Someone may be behind you.

55—Keep a handle on your file and never use a file without handle on a lathe.

56—Before jacking an engine, tender or car, place substantial blocking under jack. Also place a block or shim on top of jack to prevent slipping.

57—The steam hammer is not intended for cold iron.

58—Practical jokes are expensive because of time wasted. They have also proved dangerous, therefore "nuff sed."

59—Never strike tempered steel with a hammer or similar object. This is dangerous, as the steel is brittle and liable to fly in someone's eyes.

60—Place a screen properly secured around steam hammer when cutting straps from drawbars, as protection against flying rivets.

61—Keep your closets, tool boxes, cupboards, etc., clean at all times. Remember soiled waste, rubbish, waste paper and the like are fire hazards, besides being untidy.

62—Use trestles when removing a truck from a tender or car. Don't depend upon jacks alone, and always see that you are protected if working beneath cars or engines liable to be moved.

63—Elevators should be enclosed and protected and used only for the purpose intended.

64—Don't attempt to operate your machine and carry on a conversation. If absolutely necessary to talk, stop your machine first.

65—Beware of set screws on revolving shafts. They are dangerous. If within seven feet of the floor they should be countersunk. This applies also if they are near a point where machinery is oiled or adjusted.

66—Unless you have a spare hand, don't reach under planer rollers to remove shavings.

67—All gasoline containers, whether full or empty or partly filled, should be handled with necessary precaution. All torches, lamps, matches and the like should be kept at a distance.

68—Refill or discharge gasoline in the daylight hours when possible, and bring containers out in the light.

69—If a car inspector, don't go near a tank car containing highly inflammable gas or liquids with your oil lamp burning. There may be a leak.

70—Keep the rest on the emery wheel in position.

71—Before drilling any piece of material, be sure that it is properly secured.

72—Keep all metal and conducting material away from the

vicinity of electric switches. Someone may take hold of these and make a circuit.

73—Never feel a drill or reamer when operating same; neither allow anyone else to do so.

74—If a fellow employee or anyone becomes caught in an electrically charged wire or receives a shock from a dynamo or switch, insulate yourself before attempting to release them, using dry clothing, rubber gloves or a cane, and be sure to stand on dry boards or other dry non-conducting materials.

75—Store acetylene gas cylinders separately in a safe place. When transporting by crane or derrick, never use a sling or magnet. Watch the valves carefully and close when work is completed, also see that they are maintained in proper repair.

76—These cylinders are not intended for use as rollers or supports, and should never be so used; also they should never be dropped or permitted to strike each other or other objects violently.

77—Keep oxygen away from oil or grease, as these commodities in the presence of oxygen under pressure may ignite violently, and never use oxygen as a substitute for compressed air as a source of pressure.

78—Never attempt to mix gases in an oxygen cylinder.

79—Don't, under any circumstances, attempt to transfer acetylene from one cylinder to another; nor to mix other gas with it in the cylinder.

80—Report to your foreman all unsafe conditions. Take the safe course. Educate others to do the same.

Safety First!

Plywood Sheathing Saves Steel and Weight

Five-ply fir siding, 5/8 in. in thickness, will be used to replace .10-in. steel sheathing in the construction of 750 box cars now being built for the Canadian Pacific. Before deciding upon this substitution the railroad tested the practicability of the idea by removing the steel sheathing from a 40 ft. 6 in. double-sheathed car and replacing it with plywood. This car was then subjected to severe service tests and met all necessary requirements.

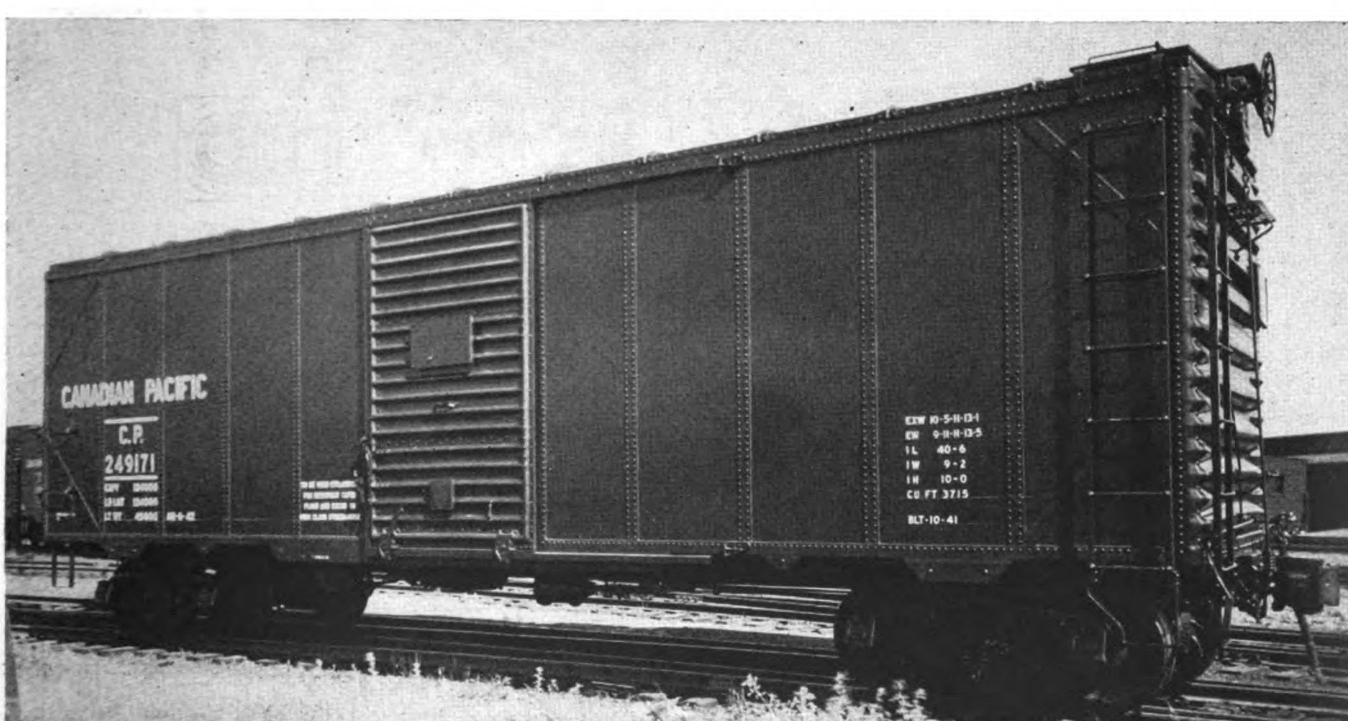
A net saving of 2,063 lb. of steel per car is realized in the replacement of the steel by plywood.

In the experimental car, after the steel sheathing was removed, plywood was applied to the Z-bar posts which formed the car structure after a bar equal in thickness to the Z-bar leg was welded on to form a cover and means for fastening the plywood in place. The plywood siding was bolted in place. The bolts pass through the cover plate, the plywood and the post, using the rivet holes which were already in the posts. The joint between the outside steel cover and the plywood was then sealed with cement.

This double-sheathed car has many advantages over the single-sheathed car of the last war period. The plywood car retains standard dimensions inside, whereas the single-sheathed car loses 1 5/8 in. in width and saves only about 500 lb. of steel. Because of difficulties in obtaining clear lumber in standard lengths the single-sheathed car suffers in comparison, as loose knots, weather checks and splits, and additional joints allow more dust and water to enter the car. In addition to saving more steel the double-sheathed plywood car provides greater protection to vital war shipments.

Locomotive Compressed Air Radiation Unit Redesigned

The grid-sectional locomotive air-compressor radiation units, supplied by the Wilson Engineering Corporation, Chicago, and mounted in pairs for parallel flow, with variable capacity either automatically or manually controlled, originally consisted of composite castings with a center of alloy iron upon which was cast the grid fin structure in aluminum. Strict allocation of aluminum to military uses necessitated substituting other metals and the revised design has been developed and successfully tested.



Double-sheathed car using laminated wood sheathing which releases 2,063 lb. of steel

The new grid section, integrally cast in alloy iron as shown on Fig. 1, is said to be the equal, per linear foot, of the original aluminum fin structure in radiation effectiveness. This might seem inconsistent because of the much higher thermal conductivity of aluminum as compared with iron. The deciding factor in this class of radiation effectiveness, however, has been shown not to lie in actual thermal conductivity of the metal, but in the speed with which the heat units are dispersed to the surrounding atmosphere from the surface of the fins. Any strong movement of air about the radiation units cannot be counted upon because locomotives are usually stopped when the air compressors are working hardest.

Comparative thermal conductivity of the metals, therefore, appears to have little to do with the effectiveness of this radiation provided only that the heat units are carried to the surface as fast as they can be carried away, which by comparative tests has proved to be the case with the revised design of Wilson radiation units.

It is recommended that the new radiation units be securely and strongly supported by the simple arrangement shown in Fig. 2. It will be noted that the sections are supported, for steam-locomotive application, by a single angle bar, which is intended to reach from boiler bracket to boiler bracket as required for support of other structures such as the running board. This makes additional brackets or supports unnecessary. The grid sections are factory tested with hydraulic pressure to 500 lb. per sq. in., two sections in parallel are equivalent to 25 ft. of 1½-in. pipe.

The assembly of two grid sections in pairs allows an interesting range of variability to meet the wide range of atmospheric temperatures. For manual variability a plug cock is inserted at the air entrance to one of the sections, leaving a free and unobstructed passage through the parallel section. The same end is gained automatically by means of a thermostatic valve. The automatic valve, however, is placed in the discharge end of the section to be cut out, because that valve must be actuated by the temperature of the air after passing through the radiation. This latter arrangement is shown on Fig. 2.

Other advantages of this type of radiation, aside from the variability feature, include its compactness and neatness of application; increased accessibility of motion work and air reservoirs as compared with pipe coils which obstruct; space available for practically any desired amount of additional radiation with this type of radiating unit.

The Wilson radiation units are standard equipment on the new 5,400-hp. Diesel-electric freight locomotives and have been installed on steam locomotives by several railroads.

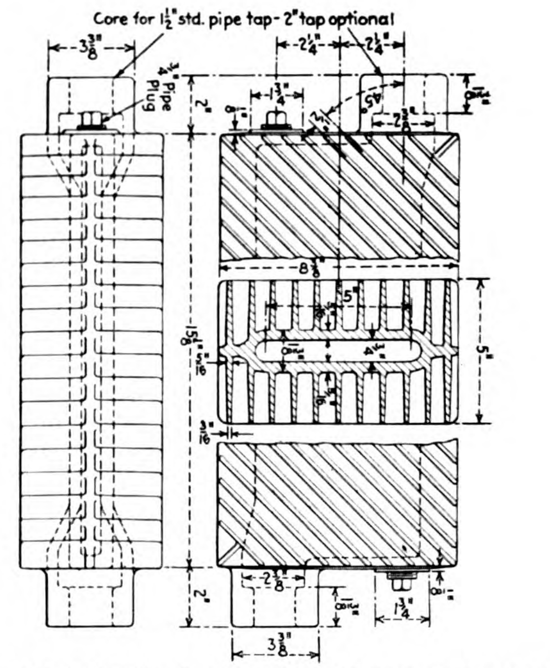


Fig. 1—Detail of integrally cast section of Wilson air compressor radiation unit

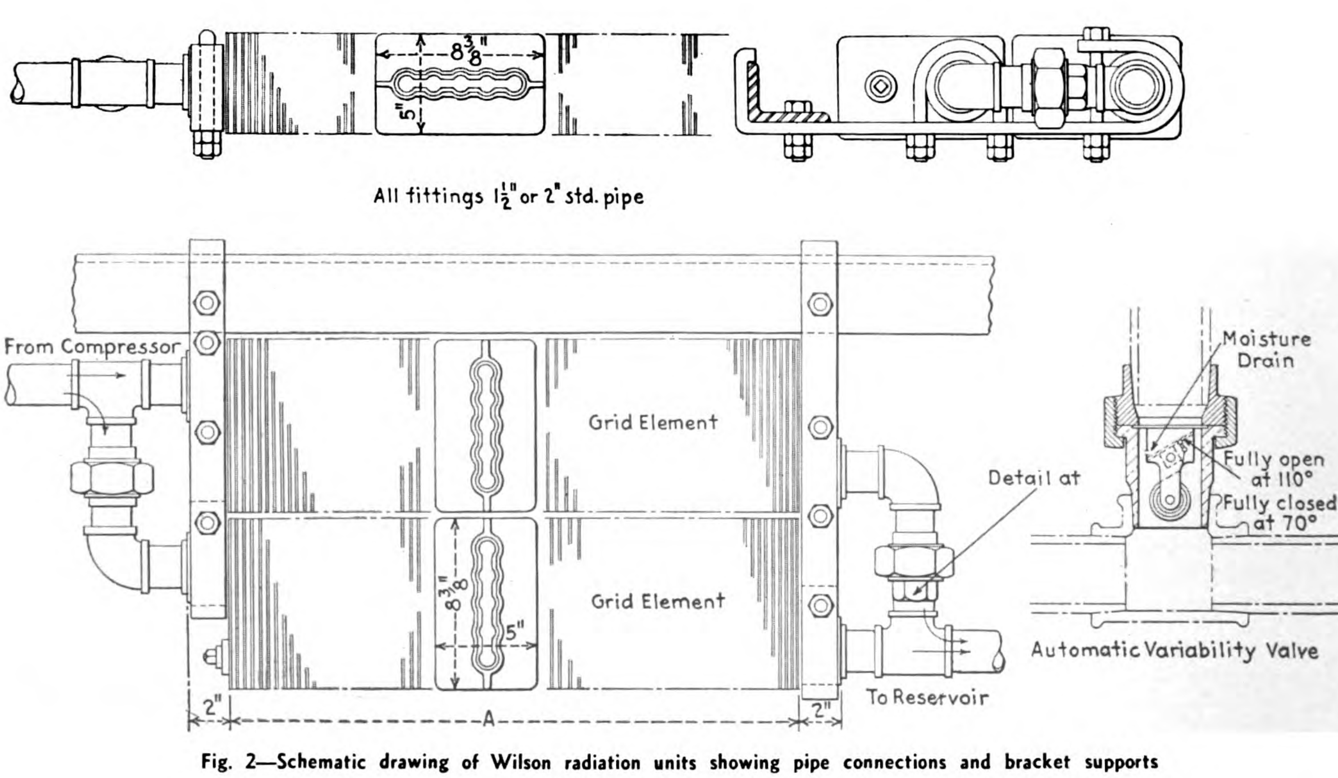


Fig. 2—Schematic drawing of Wilson radiation units showing pipe connections and bracket supports

EDITORIALS

Do You Know Why They Are Idle?

"Already a number of railroads, acting as subcontractors, are using their shop machinery and facilities to manufacture or process parts and materials for shipbuilding companies, construction contractors, ordnance works, chemical and ammunition plants and other plants engaged in the manufacture of direct materials for the government.

"These railroad shops are making or finishing parts for mine sweepers, patrol boats, sub-chasers and merchant ships. They are turning out parts for naval gun mounts, airplane-engine mountings and are also doing work on the rolling stock used by the government or by contractors in the construction or operation of munition plants."

The above statement is quoted from a report concerning the things the railroads are doing to help win the war and shows in a tangible way that much of the initial controversy concerning the possibility of doing war work in railroad shops has been cleared away to the extent that results are forthcoming. There still exist some misunderstandings on the part of both government representatives and railroad shop officers and supervisors that can profitably be cleared up.

We have heard recently of cases where government representatives engaged in making a survey of railroad shops looking for potential war production "capacity" have taken a ridiculously short time, in some shops, to arrive at the conclusion that a large part of the machine tools were idle—and therefore available for other work. It might be well to point out that the machine load factor of a railroad shop is almost always lower than that of an industrial plant on production work for the simple reason that a railroad shop of any consequence has a number of special-purpose machines the potential output capacity of which is substantially greater than the maximum volume of work which that shop has for the machines to do.

No man, regardless of his experience or ability, can walk through a shop employing over 1,000 men in less than an hour and say conclusively just how much excess capacity there is in that shop. There is only one way to find out and that is to make a study of at least 168 to 720 hours' duration of every machine in the plant. On the machines on which it is proposed to do outside work it would be well to compile an accurate record of the floor-to-floor time of every job. Then, when someone proposes to put a contract job with a floor-to-floor time of 12 hours on a machine which is idle for only one 8-hour shift there will at least be available the facts as the basis for a discussion as to whose work is more important.

Any railroad shop these days that is without the services of a trained shop or production engineer who knows the answer to the question, "What about these idle machines?" is flirting with trouble because if you don't know the answer someone else will think one up for you. A thorough knowledge of your operations will save you a lot of grief in the days just ahead.

Service Capacity of Locomotives

The Diesel-electric locomotive has built up an enviable record for high availability. Both in the yard and on the road it has in numerous instances demonstrated readiness for service for more than 95 per cent of the time. For road service this is one reason which justifies the purchase of Diesel-electric locomotives even though the first cost per horsepower of rated capacity is materially higher than that of the steam locomotive.

But when the purchase of these locomotives is under consideration, the management of the railroad must assure itself that the locomotives can be operated in a manner such that their utilization will approach the same high percentage of time as their availability. This assurance involves little difficulty in the selected passenger runs on which many Diesels are now operating. In more general assignments, particularly those involving freight service, however, careful studies must be made and close attention given to every detail of the operation in order that there may be no doubt but that the assignment finally adopted will provide sufficient work for the locomotives to do.

No comparable procedure is followed when the purchase of steam locomotives is under consideration. From time immemorial it has been the practice to secure a surplus of power as protection against contingencies. Time was when this practice was justified by the unreliability of the steam locomotive. Improvements in boiler conditions, brought about largely by a better selection of boiler feed water sources and by water treatment, have removed the boiler as the major source of unreliability and have stimulated the development of structural and mechanical improvements which have still further increased steam locomotive reliability.

If the same attention were given to the assignment of steam locomotives that is given to the assignment of Diesel-electric locomotives in road service present standards of steam locomotive utilization would appear waste-

ful in the extreme. However, with an inventory of locomotives only casually related to traffic volume, there has never been sufficient pressure to justify the effort required. Now, with a free supply of new locomotives severely curtailed at the source, the pressure for more utilization of steam locomotives is going to produce results.

How High Is Your Score?

It takes times like these to drive home to many of us how important little things are; what a big part the performance of little tasks plays in the final result. When one contemplates the thousands of detail jobs that are involved in this thing we call railroading it is quite possible that a lot of people aren't thoroughly conscious of the thorough manner in which thousands of railroad men the country over are doing those thousands of detail jobs which, added together, are resulting in some of the outstanding records.

Pick up a tabulation of the operating statistics of your own railroad or of all the railroads, if you choose. On that sheet of figures you will find dozens of familiar terms such as gross ton-miles, train-miles, car-miles or locomotive-miles most of which are somewhat abstract terms to all but a relatively few people in the mechanical department. Why be concerned with things like that for, after all, they are the headaches of the men in the transportation department. We in the mechanical department have troubles of our own. But, it might be well for mechanical men, especially in these times, to look deep enough into some of these headaches, and their background, to discover that there are rarely such things as purely departmental problems in which no one else is involved. The problems of all departments are what make the problems of a railroad.

Let's go back to that sheet of statistics again and pick one out—"miles per locomotive day," just for example. Every railroader knows what that is. It is the average number of miles that the locomotives of your road run each day. Looking back over the record you may find that way back in 1929, in the "good old days" before the depression, your road's freight locomotives averaged 65 miles a day. Ten years later they were doing just as well—65 miles a day. But—last October you find that average had jumped to 100 miles a day and in April of this year it is 115 miles a day and still going up. To the mechanical-department man who is looking for a new kind of reading matter we'd like to suggest that the freight operating statistics of your own railroad and its neighboring competitors contain some of the most fascinating stories of modern railroading, and what's more interesting, they're stories about you and the men you work with.

Maybe you think that's a hard one to prove. Well, let's go right back to one little thing—"miles per locomotive day" and see what it has to do with you. Your locomotives are the most valuable things the company owns just now; valuable because they are so badly needed to haul that thousand tons of vital war materials that are waiting out there in the yard. A locomotive isn't worth a nickel to any road unless it is out on the road hauling freight. And yet most active locomotives steam locomotives at least—ordinarily spend more of their time off the road than on; either at an engine terminal being serviced or repaired, or awaiting call. No locomotive can increase its daily average mileage standing around an engine terminal. So, as far as the mechanical department is concerned the object of this little game is to get locomotives out of our hands just as quickly as possible, and in the best possible condition.

Not long ago a committee of one of our associations made a study, over a period of 48 hours, of the daily life of one railroad's active locomotives and a summary of part of the findings might be interpreted like this:

	Percentage of total time		
	Freight	Passenger	Switching
A On the road, earning money and doing war work	33.2	31.9	46.4
B In the enginehouse for servicing and repairs	30.4	29.9	20.1
C Waiting for something to do	36.4	38.2	33.5

It might be a good idea if a "scoreboard" like this were posted in every enginehouse in the country so that every man that walked by it could take a good look once a day and "see what the score is." It might also be worth while to put up one of those Community Chest campaign thermometers on which the road's daily average locomotive mileage figures were posted each month so the men could see how things were going. Right away someone is going to ask "What good will all this do?" That is where you and the importance of little things come into the picture.

Of the three periods in the daily life of an active locomotive—A, B and C in the summary above—there is really only one, B (in the enginehouse for servicing and repairs) about which the mechanical department can do very much directly but what we do about B has a very decided influence on A and C. Let's suppose, for example, that when a locomotive is in the A class it is in the hands of the train despatcher; that when it is in the B class it is in the hands of the enginehouse foreman and when it is in the C class it's really a reflection of general motive-power policy—that is, the management's worry. The manner in which the game is played is for the enginehouse foreman to get all his power into Class C as quickly as possible. If locomotives stay around too long in Class C (thereby running up the percentage) it is always possible to "put 'em in whitelead." The nice thing about this game, when the score is posted where everyone can see it, is that it gives everyone concerned a chance to do something they like best of all to do—to pass the buck to the other fellow. All the enginehouse man has to do is to think up every trick known to the trade to move every locomotive from the inbound pit to the outbound ready track in the short-

est possible time and then pass the buck to the despatcher. When this has been done for two or three months take a look at the scoreboard; Class B goes down and Class A goes up. What happens to Class C depends on the volume of business and power policy.

There are many little tricks that will help an enginehouse man cut the percentage in Class B. Take inspection, for example, for checking heights of brake rigging, pilots, and things like that above the rail. How do you do it? At one enginehouse we saw a simple electrical device on the inbound end of the ash pit that lights a red light and rings a bell in the inspectors' shanty if anything on the locomotive passing over the device is lower than the prescribed limit. Another little stunt for checking steam leaks, also near the inspection pit, made it possible to do the job in seconds instead of minutes. Well arranged ash, coal and water facilities make it possible to get them over the table and into the house in remarkably short time. We don't have to go into detail about the value of good tools, good organization and good men in cutting down the time required for repairs. Modern lubrication systems and modern high-pressure grease guns cut down the time for doing that most important job.

These are the thousand-and-one little jobs which, in themselves, all add up on the scoreboard. If you mechanical men will just use your native ingenuity there are many ways in which you can get locomotives through the house in a lot less time than it takes now. If you do your job and make it possible "to keep 'em rolling" you'll be surprised to see the percentage of time in the enginehouse go down and the miles per day go up.

And—here's a little hint to the management. If a notice offering a prize for any idea that will get locomotives through shop or enginehouse faster is posted alongside the scoreboard maybe even the "brass hats" will be surprised when they look at the board.

What About Supervisors?

The Division of Transport Personnel of the Office of Defense Transportation has estimated that, before 1943, the railroads will have added at least 320,000 new workers to their forces. The problems involved in recruiting this personnel were fully covered in the Freight Progress Issue of the Railway Age by Otto S. Beyer, the director of the division. It is not too late to point out that Mr. Beyer concerned himself only with the questions of how many new employees would be needed and what labor sources could be tapped to obtain them. The railroads themselves must face and find a solution to another closely related problem—finding enough qualified supervisors to assure the maximum return for each labor dollar spent.

Up-graded helpers and laborers, short-term apprentices, reassigned mechanics and new workers all need help in adjusting themselves to new tasks. They have a right to the benefit of advice, assistance and correction from a superior who is not so loaded down with responsibilities that no time can be found to direct operations properly. Studies have shown that work spoilage, errors and accidents occur in almost direct ratio to the supervisory personnel where mechanical operations are involved. This is true even when most of the workers are reasonably skilled; it should be seriously considered in cases where workers are new to their jobs.

An overworked supervisor is necessarily a poor one because he finds it impossible to keep track of everything for which he is responsible. Very often an overworked supervisor is not respected by his men because they fail to understand why he can find no time to answer questions or spend sufficient time on a difficult job to work it through to the end. An overworked supervisor is an added expense to his employer because spoiled work, accidents, lax discipline and general slackness among shop personnel cost money and delay shop output.

For many years we have directed attention to the plight of the average enginehouse foreman and his twelve-hour day. With the present intensive use of motive power, shorter turn-arounds and less time in the engine terminals for locomotives, the pressure on these men is still further increased. Shorter working days may not be the immediate answer but more assistant foremen can be assigned to insure proper performance of all required repairs and a full return on each labor dollar spent.

Locomotive and car shops are, in many instances, undermanned in the same manner as are the enginehouses. Generally the hours of work are a little shorter but the pressure of work is no less heavy. No accurate figures are available to indicate the true ratio between workmen and supervisors, but instances will be frequent where, if a thorough job study was undertaken, it will be found that men are being called upon to do a great deal more than time will permit to be performed efficiently.

It is the supervisor "on the job" that counts, not one who spends time in an office with only an occasional glimpse of the inside of the shop and a fleeting contact with the men and the work which are his responsibilities.

In the aircraft industry it is estimated that one supervisor is required for each eight employees engaged in production work. Railroads may not, probably do not, require any such proportion of supervisory personnel. However, if they are to continue their fine record in the maintenance of equipment with an influx of new employees, added to those already employed who are not fully conversant with the requirements of their jobs, the railroads must for their own benefit give relief to already overburdened supervisory forces by adding enough additional leaders, assistant foremen and foremen so that work will be properly done, shop output maintained and the accident records held at the lowest possible figure.

Carloads of Trouble

By
Walt Wyre

DICK WHEELER, car foreman for the S. P. & W. at Plainville, was right in the big middle of a quandary stuck on a dilemma between the devil and deep blue sea, and also in the eight by ten shack that had served as a coalhouse until a gas burner was installed in the roundhouse blacksmith forge, then converted into an office for the car foreman. The thing that had Dick Wheeler bothered was a traingram from the superintendent saying that six carbon black cars must be forthcoming each and every day until further notice. Three per day had been the previous quota and he hadn't made that. If he hadn't known it, there was a traingram on his desk reminding him in no uncertain terms. There was also a traingram from the master mechanic saying that the two additional carmen and helpers requested could not be furnished because there were none available.

Wheeler rose from the desk and walked to a window and looked out at the rip track full and overflowing with cars, each with a bad-order card and each badly needed. He walked to the door and looked out, but the view wasn't any better. All he could see was a string of box cars waiting to be prepared for hauling the creepy, crawly black powder that is used in rubber tires to make them wear longer and dozens of other purposes. Each one of those cars had to be caulked and smoothed, lined with cardboard until there wasn't a single nail or splinter to tear the paper bags containing carbon-black or a tiny crevice for the stuff to sift through. One of the cars had a short ladder at the door indicating that some one was inside the car working, or at least had been.

Eleven carmen, six helpers, and four laborers, a write-up man, and the foreman constitutes the personnel of the Plainville car department. H. H. Carter, the master mechanic, had called Dick Wheeler's attention to that fact the day before when Wheeler had told the master mechanic that additional men would be required if six carbon-black cars were to be turned out besides the other work.

"Three of the carmen are inspectors, one is locomotive carpenter in the roundhouse, and Bill Jackson is busy in the mill all the time. Half of the time Bill is making cabinets or repairing furniture for the offices," Wheeler added. "That just leaves five carmen working on the rip."

"Well, we can't get any more carmen," Carter said, "and six carbon-black cars is what the superintendent ordered."

While Wheeler was standing in the door, Ray Anderson, the master mechanic's clerk came up. "What's the matter?" Ray asked. "Somebody take your lolly-pop?"

"Wish I was of draft age," Wheeler said. "I'd join the army."

"Yeah, that's what they all say that are exempt. But speaking of preparedness, when are you going to have Bill Jackson take down the screens and put up the storm doors on the office? What do you say we break the good old American rule of waiting until the next minute after the last!"

"I'll tell Bill to get on them soon as he has a little time," the car foreman conceded.

After the clerk left, Wheeler made the rounds of the rip to see if there wasn't one more carman that could be put on the carbon-black cars, knowing at the same time chances were slim. There were only four carmen and that many helpers that might possibly be put on the carbon-black cars and all were busy as a Brooklyn bartender the night the "bums" won the game in the "world's serious." Two of the carmen were working on a foreign car loaded with perishable stuff. The car had to be ready that night. One carman, and a helper, were changing two pairs of wheels, one pair on each truck of a baggage car; the other was cleaning and testing air equipment.

Wheeler passed the loaded reefer, then turned and walked back to where the men were working. "How long will it take to finish?" he asked.

"Oh, about three hours," one of the carmen replied.

"Well, all of you go over on the carbon-black cars and work until quitting time, then finish this one after five o'clock. Don't pile up any more overtime than you have to," Wheeler added.

That day six carbon-black cars were O. K.'d and twelve hours overtime charged to the foreign reefer.

Next morning when Wheeler came to work, he found the rip track in fairly good shape. He could put two men on carbon-blacks before noon and perhaps two more in the afternoon.

HE had things lined up and going good when the dispatcher called. "Get the wrecker ready to leave at once! Engine and five cars on the ground about three miles this side of Middleton," the dispatcher said.

The wrecker took two carmen, three helpers, and two laborers from the car department.

The wreck gave Wheeler a plausible excuse for not getting out his quota of carbon-black cars that day and the next; but besides an extra accumulation of work on the rip track while the carmen were cleaning up the wreck, four damaged cars from the wreck were brought to Plainville to be repaired.

Nine carbon-blacks finished, a bawling out from the super for not getting more, and circles under his eyes from loss of sleep occasioned by the wreck was the net result by Wheeler that week. He swore to get out six carbon-black cars per day next week if he had to let everything else go.

Monday morning started off for the car foreman like a breakfast food advertisement. A carman had unexpectedly shown up to go to work and there was a brand new air operated portable sanding machine; then when Wheeler asked the storekeeper about cardboard and glue for papering the carbon-black cars, the storekeeper replied there was plenty of both in a car waiting to be unloaded. A new machine to speed up the work, plenty of material, and a man to use them! Dick Wheeler was almost ready to believe the emergency was over, despite headlines in the morning paper saying that more men and material were needed by Britain.

Wheeler showed the new man how all of the cracks,

even the tiniest ones in the floor, were to be filled, nails driven down and rough places smoothed with the sanding machine. Then he showed him how the walls were to be surfaced and cardboard glued on.

"They are more particular than flour cars," the new carman observed.

"That's right," Wheeler agreed, "and if they are not just right the carbon-black people won't take them."

Everything was going along smooth as a well shaped leg in Nylon stockings—we're saving the silk for powder bags and parachutes—when about ten o'clock the new sanding machine slowed down, gasped, and stopped. The air hose went limp. The carman swore and climbed down out of the car to see who had turned off the air.

He tried the valve and found it to be still open. He tried another valve and there wasn't any air there either. He found the car foreman and told him there wasn't any air.

"Maybe the air compressor at the roundhouse stopped," Wheeler told him. "That happens sometimes. If it doesn't come on soon, let me know and I'll see about it."

"It would be mighty slow work smoothing the inside of them cars by hand," the carman said.

"Yes, we've been getting along with just one machine. I sure was glad to get another one," Wheeler said. "You might as well go ahead filling cracks and getting another car ready while waiting for the air to come on," he added.

At eleven-thirty the car foreman went to see how the men were getting along with the carbon-blacks. The foreman found four cars ready for surfacing and the air still off. He headed for the roundhouse like a soldier going to mail call. About half way to the roundhouse Wheeler saw a water service man working on a pipe line. He was using a torch cutting an old line of two-inch pipe into lengths that would be convenient to handle.

Wheeler paused a moment. "Putting in a new line to the car department?" he inquired.

"Yes, this one is pretty well shot"—the water service man raised his goggles up on his forehead—"it was leaking all along," he added.

"Yeah," Wheeler started to leave, "I've noticed the water was rusty several times," he observed.

"This is an air line," the water service man said as he pulled his goggles down over his eyes.

"What!"—Wheeler turned around—"Is that the air line to the car department?"

"Yep!" The water service man held the torch close to the pipe and prepared to make a cut.

"That's why we haven't got any air!" Wheeler exploded. "How long will it be before you'll have the new line in?"

"About three days." The water service man pressed the oxygen valve and held it down until the flame had eaten through the pipe.

"But we've got to have air," Wheeler remonstrated. "Why didn't you tell me you were going to cut the air off?" he asked.

The water service man shut off the torch, lifted his goggles, and looked up. "You can't get air without a pipe line," the water service man said. "I thought you had asked for a new line."

"I had, but I can't think of a less convenient time to shut off the air to put in a new line," Wheeler complained. "Besides, why couldn't you run the new line before you cut the old one?"

"Never thought of that," the water service man rubbed his chin reflectively. "I'll renew what pipe I've got cut out and connect it up so you can have air while I'm running the rest of the line," the water service man agreed.

"How long will it be before I can get air?" Wheeler asked.

"Maybe late this afternoon," the water service man replied.

Wheeler groaned and went back to the car department. Working without the sanding machine was something like climbing a treadmill, lots of exercise with little to show for it. The car foreman decided to put all carmen to work cleaning up other work on the rip, then put all hands and the cook, if there had been a cook, on carbon-blacks as soon as the water service man connected the air line.

It was after four o'clock when the water service man told the car foreman that he could get air, too late to do much on carbon-blacks that day, but the repair track was pretty well cleaned up and he would give them hell tomorrow.

Wheeler went to work early that morning. The rip had been switched during the night. All of the O. K.'d cars had been pulled out and he noted with satisfaction the few bad orders that had been set in. Prospects for a good day on carbon-blacks looked promising.

The car foreman sat down at his desk and started going through the morning mail. He found the usual and expected reminder about carbon-black cars and little else to worry about until he picked up the last yellow slip at the bottom of the pile. It was a traingram from the superintendent saying that a conductor and trainmen were complaining about condition of caboose, particularly rough riding. "These conditions must be corrected immediately. It should not be necessary to call attention to the fact that cold weather may be expected soon and all cabooses should have windows and doors weather-stripped and otherwise placed in condition for winter service. This work must be done at once."

Wheeler grimaced like a man eating beans that had bit down on a rock. He knew by past experience that the trainmen would not be patient and there was only one thing to do, put at least one carman and helper to work on the cabooses, which meant two men less for work on the carbon-blacks.

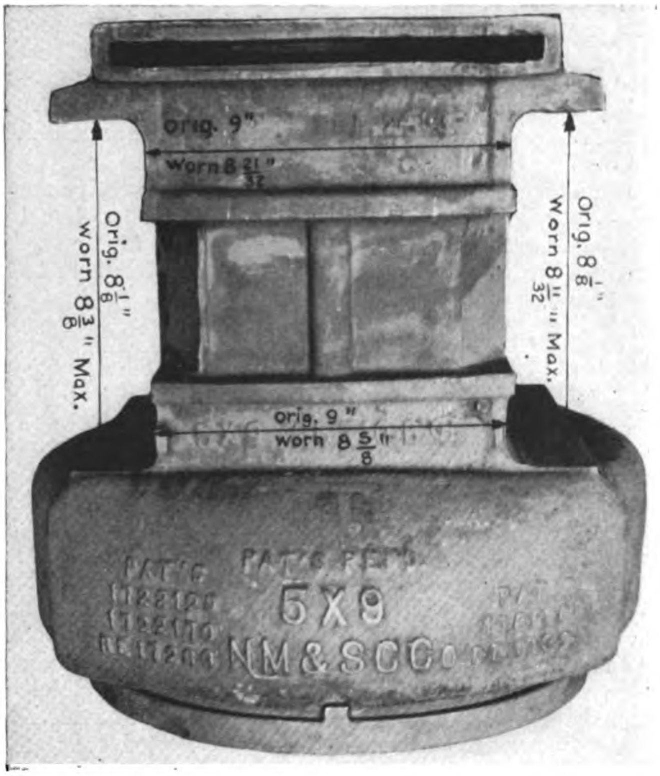
Eight cars were O. K.'d for carbon-black service that day, but little was accomplished on other work. Besides, the air being off one day and cabooses to be worked, other minor incidents interfered with work on the carbon-black cars that week. Among other things, a streamlined passenger coach with four slid flat wheels and defective air was set out by the Limited to be repaired. There was some more overtime to explain that day. Saturday morning Wheeler was looking over the records, not that he needed any record to know just how many carbon-black cars had been turned out that week—sixteen up to then and prospects of no more than four that day. The superintendent would go so high he would need a parachute to come down. There were plenty of excuses to offer for not getting the cars out, but the super didn't like excuses. "Can't use them to haul loads," the official would say as he had often said.

While Wheeler was sitting in the office getting dandruff under his fingernails scratching his head, the telephone rang. It was the chief despatcher's clerk calling. "There are seven cars at the Plains Milling Company that are not needed right now," the clerk said. "They've been setting some time, better look them over and we'll pick them up for other use."

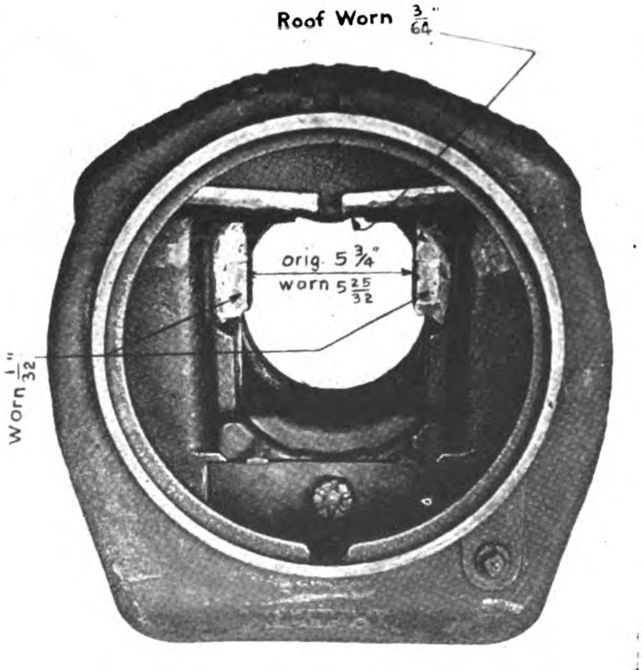
(*Continued on page 350*)

Long-Life Journal Box

The Isothermos journal box manufactured by the National Malleable and Steel Castings Company, Cleveland, Ohio,* has established a service life of one million miles under a baggage car operated in high-speed service. During this period of service a journal bearing life of over 350,000 miles per bearing was obtained and when the boxes were removed they themselves were checked and measured for wear. The exterior view of one of the boxes removed shows the original dimensions and the extent of wear; the other shows wear on the interior of the box.



Condition of exterior of Isothermos self-lubricating journal box after a million miles in service



Interior wear on an isothermos journal box after a million miles of service

* For a description of this box and other performance records see the *Railway Mechanical Engineer*, March, 1941, page 103.

Air Brake Questions and Answers

HSC High-Speed Passenger Brake Equipment

51—*Q.—When is this valve open and closed?* A.—Open when coils are de-energized, closed when coils are energized.

52—*Q.—What is the duty of the application valve?* A.—To open or close communication between auxiliary reservoir and straight air pipe.

53—*Q.—When is this valve open and closed?* A.—Open when coils are energized, closed coils are de-energized.

54—*Q.—Explain the operation of both valves.* A.—When coils are de-energized, spring (*35*) unseats release valve, opening straight air pipe to exhaust and a second spring (*35*), seats application valve, closing communication between auxiliary reservoir and straight air pipe. When coils are energized, their armatures pull stems (*27*) down, seating release valve, closing communication between straight air pipe and exhaust, and unseating the application valve, opening communication between auxiliary reservoir and straight air pipe.

55—*Q.—How are the coils energized?* A.—From the application and release wires as controlled from the master controller.

56—*Q.—What protection is given against the loss of auxiliary reservoir air in the event of abnormal magnet valve operation or broken straight air pipe?* A.—A cut-off portion.

57—*Q.—What does this portion consist of?* A.—A diaphragm (*6*), a valve (*5*), spring (*10*), and spring (*17*).

58—*Q.—Describe the operation of the cut-off portion.* Diaphragm *6* controls the position of the valve *5* located in the supply passage from the auxiliary reservoir to the application magnet. Spring *10* having an approximate value of 75 lb. acts on the diaphragm against the auxiliary reservoir pressure under the diaphragm. When the auxiliary reservoir pressure exceeds the spring value, the diaphragm is deflected upward, permitting spring *17* to hold valve *5* off its seat, permitting flow to the application magnet.

59—*Q.—What happens in event of straight-air pipe leakage causing loss of auxiliary reservoir pressure?* A.—The 75 lb. spring will deflect the diaphragm and seat the valve closing the auxiliary reservoir supply.

60—*Q.—What does this operation provide for?* A.—Sufficient auxiliary reservoir air is retained to provide an adequate automatic brake application.

The FS-1864 Relay Valve

61—*Q.—What does the FS-1864 relay valve consist of?* A.—Referring to Fig. 5 the relay valve consists of the relay portion *10* inshot valve portion *80* and magnet bracket *120*, these portions being bolted to the pipe

bracket from which they are removable for cleaning and inspection without breaking the pipe connections.

62—*Q.—How are the pipe connections on the pipe bracket designated?* A.—Pipe connection *6* to the main reservoir pipe; *16* to control valve pipe; *30* to the brake cylinder pipe. (See Fig. 15. also.)

63—*Q.—How is the relay portion constructed? (See Section B-B, Fig. 5.)* A.—Similar to that of the B-3 relay valve except that a large diaphragm *38* is fitted to the piston being assembled to the piston by followers *39* and *40* and retained between the body casting and diaphragm ring *71* so that the tension of release spring *42* is exerted on the diaphragm.

64—*Q.—Is this the only diaphragm?* A.—No; there are three additional diaphragms *68, 64* and *60* assembled on a central bolt between followers and a pusher plate.

65—*Q.—Are these diaphragms of the same area?* A.—No; they are all of different areas.

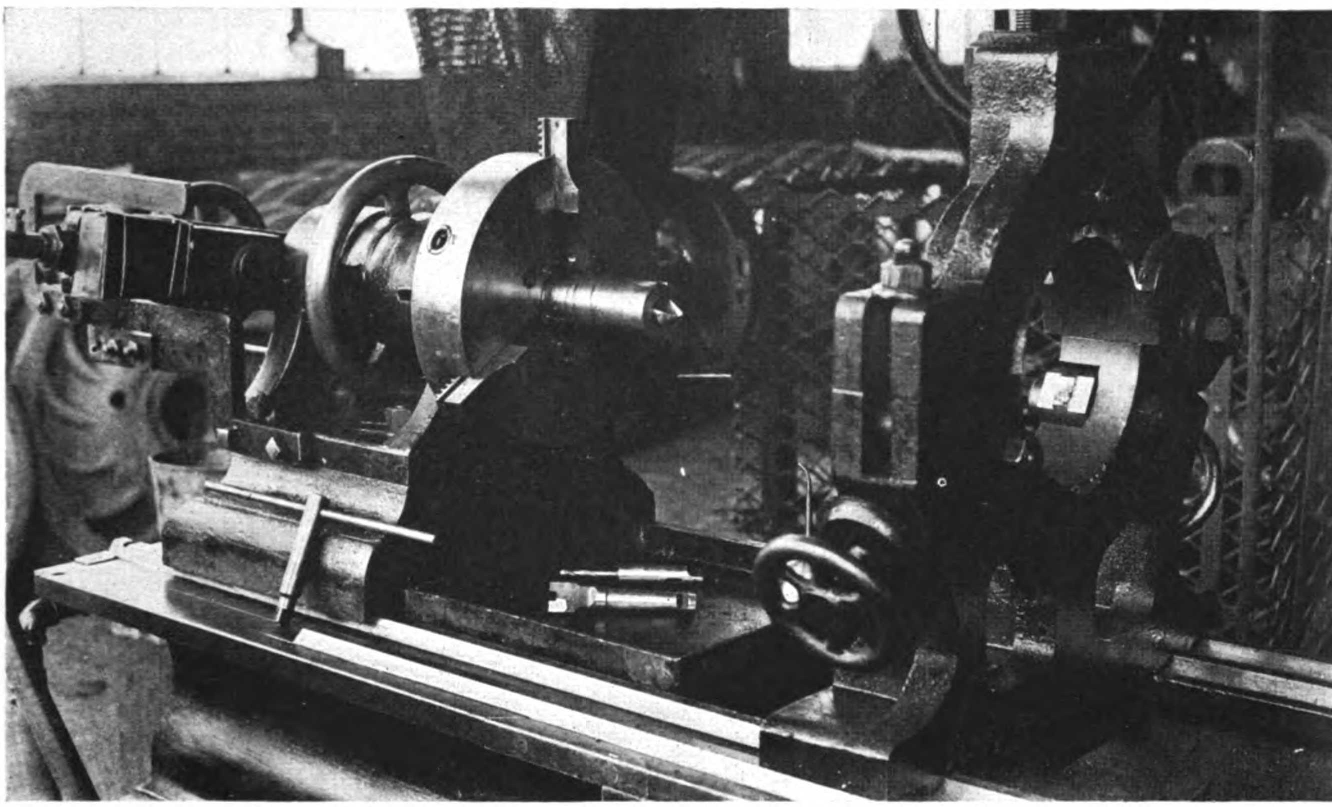
66—*Q.—How do they compare with the large diaphragm 38?* A.—They have areas of 80, 60 and 40 per cent with respect to the area of the large diaphragm.

67—*Q.—How are these diaphragms arranged in relation to each other?* A.—The diaphragms are located centrally in the body between the four rings which are dowelled to each other so that the diaphragms form a stack in which the central bolt engages the nut *40* in the large diaphragm assembly, through which the spring *42* exerts its release tension on the complete stack.

68—*Q.—What provision is made to release the air from the chamber formed between the diaphragms?* A.—Intermediate and large diaphragm rings *71, 63* and *67* are drilled for port connections to these chambers. Three check valves *51* weighted by springs *52* are located in the passages to the diaphragm chambers which provide for a direct release of air from the chambers.

Device for Centering Car Axles

A convenient and accurate device for re-centering car axles is shown in the illustration. It consists of a No. 9 Thor air motor, applied by a bracket to the tail stock of an axle lathe and arranged to drive the dead center spindle in which is inserted a counterbore. The spindle is fed by the hand wheel. In operation the chuck is used to center the end of the axle accurately with respect to the collar and hold it while the center is being drilled and counterbored. The ⅜-in. relief drill and one of the counterbores are shown in a drip pan which rests on the ways of the machine.



Air-motor-driven counterbore applied to the tail stock of a lathe for recentering car axles

Inspect Air-Conditioning Equipment Daily*

By E. F. Davis

The New York Central follows more or less the same practice as all other roads in making classified or periodic inspections of air-conditioning equipment, weekly, semi-monthly and monthly—which are done as required, and I do not think it is necessary to go into the details of these inspections. However, a more thorough *daily* inspection will go far to prevent costly equipment failures and repairs. It is our opinion that, as most electrical defects are of a progressive nature, in many instances we are able to correct various cases of trouble

* Excerpts from a short paper presented at the May 19 meeting of the Car Department Association of St. Louis by E. F. Davis, electrical foreman, New York Central.

that could result in serious damage between classified inspection periods.

Daily Inspection Form

As a guide for this method of daily inspection, a form has been devised and used in the Big Four area during the past year with gratifying results. This form is headed up to show type of equipment, date and class of inspection given, car number and point where inspection is made, record of train in which car arrives and departs. All essential parts of equipment are named on this form and, as the workman makes his inspection of the equipment, he checks off each item at the car; there are 79 points to check on the daily inspection which may vary due to the different types of equipment, or summer or winter service, as the case may be. When the inspection is completed, the workman signs the form and turns it over to the electrical foreman to be checked and placed on file for record and reference.

Following is the detailed procedure in the use of this form:

Examine the "Report and Defect" card, which is carried in a receptacle inside the control locker door, and repair such parts, or correct defects, that may have occurred en route.

Start the blower fan to ascertain if it runs quietly; then pass through the car and make certain that the air flow is normal. If the blower fan is noisy or, if abnormal flow of air is noticed, the cause thereof should be corrected.

Examine the fresh air intakes and filters, and make sure they are fully open and free from any obstruction or dirt.

Examine the heating system valves and adjust any that may be sticking in "On," "Intermediate," or "Off" position.

The vapor control panel front should be removed and all parts of the panel mechanism carefully checked. Relay contacts must be cleaned with a piece of coarse canvas when found in need of cleaning; sand paper, emery cloth, files and such other coarse abrasives must not be used under any circumstances.

Check the cooling, heating and blower fan thermostat tubes. In testing the thermostatic control equipment, the workman must keep in mind that the object of his test is to see if the various mechanisms, such as steam valves, compressor and associated equipment such as relays, etc., will respond to the respective change in temperature of the air around the thermostat; this change in temperature will cause the mercury column inside the thermostat tube to rise or fall, thus closing or opening the electrical contact through it and which, in turn, operates a relay that controls the steam valve or compressor as the case may be.

Make a visual inspection of the evaporator and its parts, expansion valves, drip pan, drain pipe, and flexible duct connections.

Check the compressor and compressor motor interior, and condenser for any visible defects; check Freon level at receiver tank, also, piping, valves and fittings for any indications of Freon leaks.

Make certain that all V-belts are of approximately the same tension and are in proper place. Due to the present rubber shortage, the conservation of belting is of the utmost importance.

Examine the compressor control panel, check all relays and contacts, also, fuses or circuit breakers.

Inspect the batteries as to general condition and water level. Take specific gravity for a check on operation of generator equipment.

Inspect the generator axle and nose suspension and shear ring, or the driven unit, drive shaft and clutch as the case may be.

Open up the generator, inspect the brushes and interior; also, reversing mechanism.

Inspect generator and lamp regulators; examine all contacts and relays of same.

All wiring must be free from grounds; slight grounds, that heretofore were of no consequence insofar as lighting equipment was concerned, interfere seriously with the control circuits.

It may be said by many in the electrical field that this procedure is too extensive for a daily inspection, but it has been our experience in the past year that it has brought results not only in cutting down failures but in conserving materials. Due to priorities and shortage of raw materials, we feel that there is no better time to abide by the old adage, "An ounce of prevention is worth a pound of cure."

Be thorough in your inspection with a view to conserving vital electrical materials so essential to National Defense.

Carloads Of Trouble

(Continued from page 347)

"O. K.," Wheeler said, hung up the receiver and left the office. He started to find a helper and tell him to take a bucket of packing, go over to the flour mill track and see that all boxes were in condition, but changed his mind and headed towards the mill.

The seven cars had been repaired at Middleton, O. K.'d for flour, and sent to Plainville. The foreman walked around the cars. He opened the door of each car and looked in. All of them were in good condition but not so good that an experienced inspector looking closely couldn't find one or more defects on each of them.

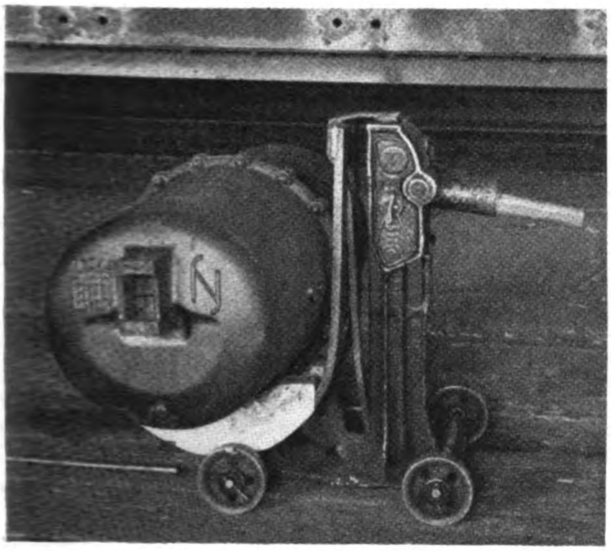
Wheeler walked over to the inspector's shanty and found the first trick inspector waiting for a drag that was expected in about an hour. "Go over to the mill track and inspect the seven cars on the east end of the track," Wheeler said. "If you look close enough I believe you can find enough defects to put a bad order card on each of them." He then went back to his office and called the yardmaster. "There are seven cars at the flour mill to be set in on the rip track. Wish you would get them soon as possible," Wheeler told the yardmaster.

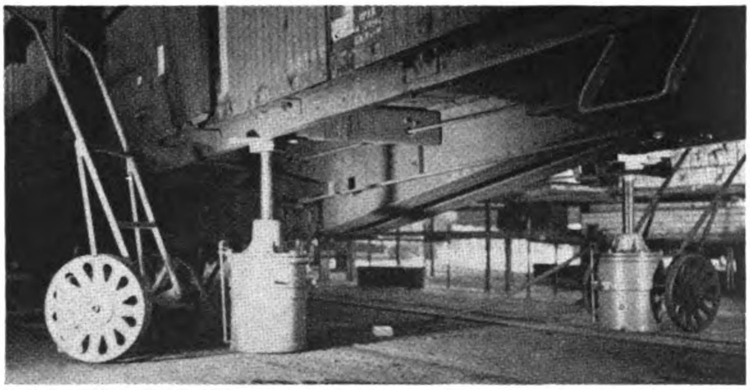
The seven cars were shoved in on the rip track just before noon. At one o'clock Wheeler told a carman and helper to look them over and do just as little work on them as possible to make them ready for carbon-black loading. He also told a helper to look the boxes over and see that all packing was in good condition.

Just before quitting time Wheeler called the superintendent and told him that twenty-eight carbon-black cars had been turned out that week despite several delays.

"Well, you're doing a little better," the superintendent replied, "but not good enough. I want thirty-six next week and no alibis."

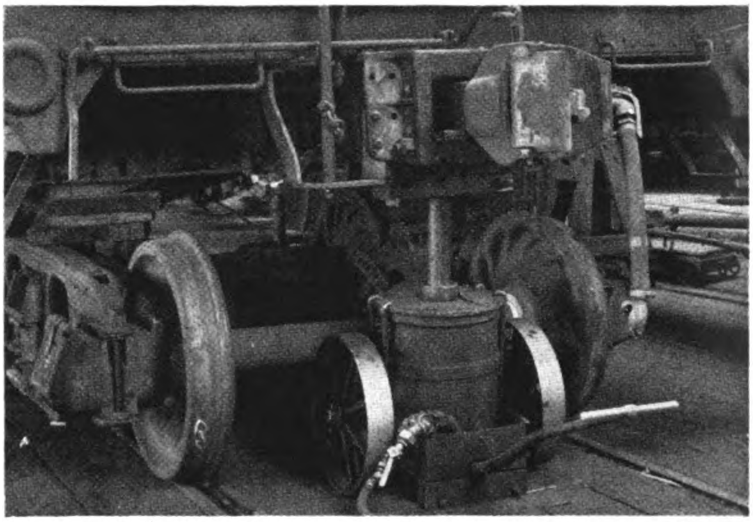
The car foreman placed the telephone receiver on the hook and sat there at least five minutes wondering about two things—how in thunder could he hope to do any better next week or even as well unless there were some more flour cars, and what was going to happen when they started yelling for flour cars and found them hauling carbon-black!

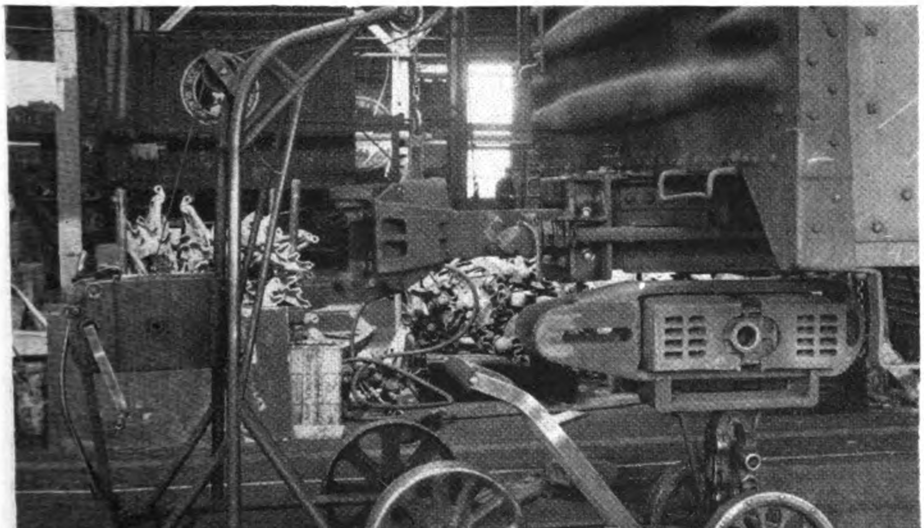




Left: A jack, with small wheels, arranged for raising and lowering AB brake cylinders underneath the car—*Above:* A pair of air jacks, equipped with safety valves, for raising and lowering cars—The jacks are moved about and spotted by the light two-wheel carriage, of welded pipe, with lugs to engage the cylinder and roller-bearing wheels—*Below:* Another type of air jack equipped with its own carrying wheels

Great Northern Car Shop Devices





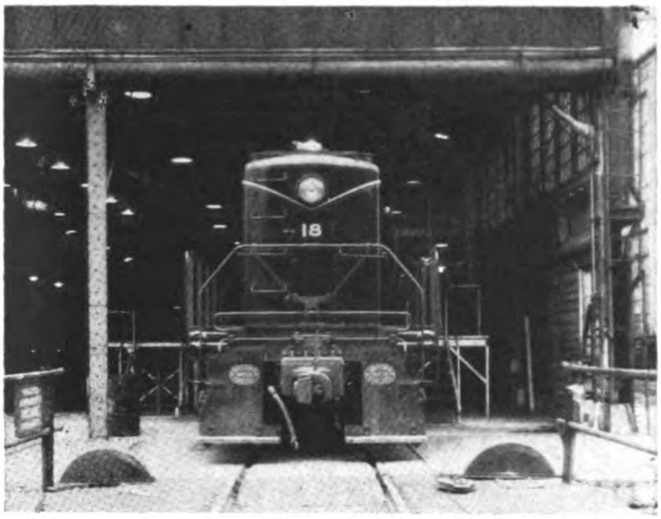
Left: One man can easily remove old couplers and apply repaired couplers, including the draft key, to 10 cars a day with the crane made of welded pipe with light roller-bearing wheels and a hand winch—To the right of the crane is a mobile draft-gear jack, mounted on light roller-bearing wheels—*Right:* Another method of applying AB brake cylinders—a two-wheel truck with a holding bracket to support the cylinder and reservoir—Its upturned handles enable one man to place and hold the cylinder while it is being bolted.

L. & N. Equips

Diesel Repair Shop

Installs all facilities needed for prompt and convenient handling of periodic inspections and necessary maintenance work

THE Louisville & Nashville operates a total of 14 Diesel-electric switching locomotives, including five Electro-Motive 600-hp., five Alco-G. E. 660-hp. and four Baldwin 660-hp. units. Two of these locomotives have been in service over 33 months. These Diesel switchers are used at Louisville, Ky., in train-yard and industrial-plant service. They are operated on a three-shift basis, and are held out of service one shift each month for federal inspection as well as any necessary maintenance.

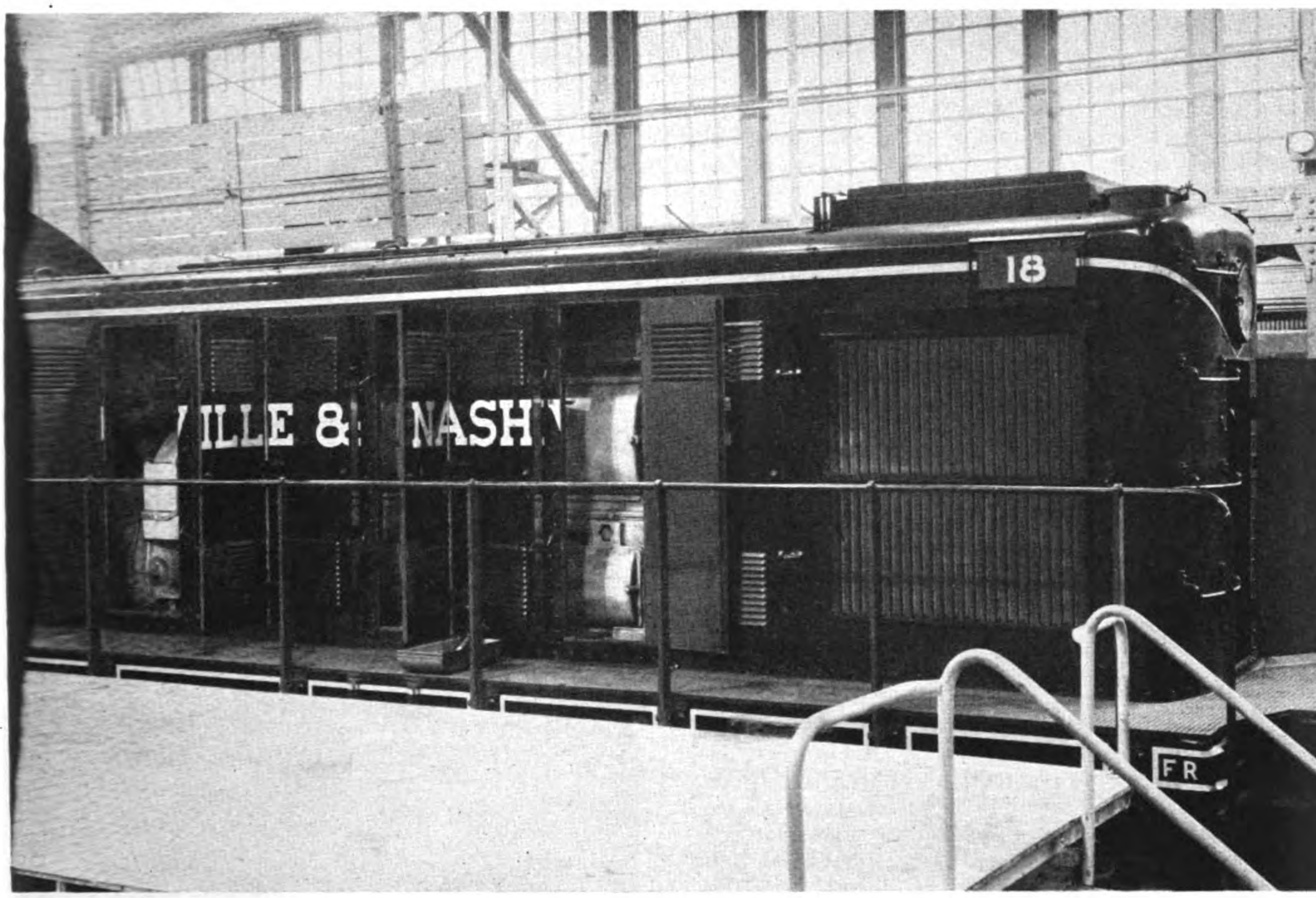


A locomotive coming out of the new Diesel shop

To assure uniformly satisfactory service, the locomotives are given daily inspection in the yards during the crew's 20-min. lunch period. An automotive-type panel truck has been fitted up with necessary filters and a supply of oil and grease and is manned by a mechanic and helper who see that all locomotive parts are suitably lubricated. Fuel oil and sand are supplied by means of four portable fuel and sand stations located at strategic points in the yard. Fuel is taken about every third day with minimum interference in the work of the locomotives which show a high percentage availability and utilization.

Once every 12 months the locomotives are given an annual inspection and testing and the desirability of shopping the locomotives for heavy maintenance and general repairs on about a 4-yr. period called attention to the need for suitable facilities for handling this work. Early this year, therefore, the L. & N. set aside two bays in one of its freight-shop buildings at So. Louisville,

Alco-G. E. Diesel-electric switcher on the transfer table outside the South Louisville shops



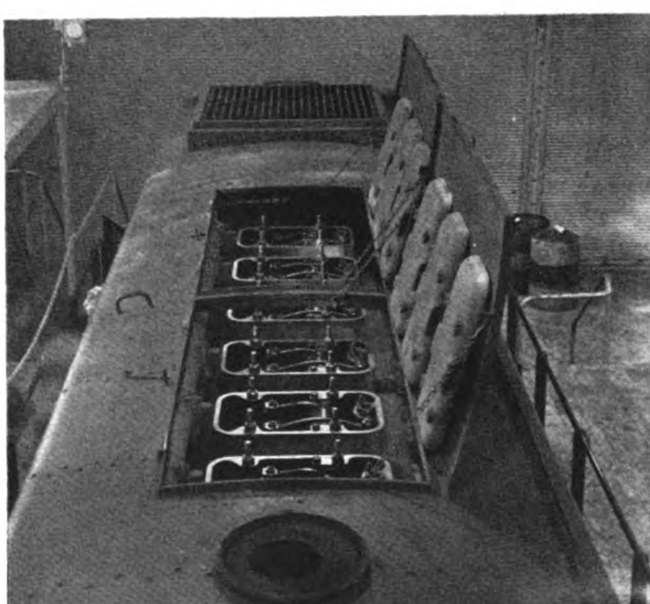
Center work platform in the foreground and side drop platform in the upper background

Ky., partitioned off a two-track section roughly 44 ft. wide by 140 ft. long and provided modern heating, lighting and ventilating facilities. Wheel pits and working platforms at two elevations above the floor have been installed together with all special equipment and tools required for the suitable handling of Diesel locomotive repairs.

The two tracks are spaced 20 ft. on centers and the wheel pits and working platforms occupy a length of 50 ft., approximately 19 ft. back from the entrance doors. The wheel pits are 4 ft. deep and there are heavy jacking blocks outside the rails at the four corners. The level of the shop floor is made about 20 in. below the rail top so as to facilitate inspecting trucks from the outside, easily changing brake shoes and hangers, checking wheels and journal boxes, etc. The wheel-pit depth is set at 4 ft., which is the average most convenient for a large majority of the operations which have to be performed under the locomotive.

Center and side working platforms elevated 4 ft. 4 in. above the rail tops, give easy access to the locomotive running boards by stepping across a 12-in. clearance space. Fixed working platforms 8 ft. wide on one side of the shop and 5 ft. wide on the other are suspended from the shop ceiling. They are placed at an elevation to correspond with the top of the Diesel-electric locomotives. A counterweighted drop extension platform, 4 ft. wide by 15 ft. long, on either side extends the elevated working platform when desired to the narrowed top of the locomotive for easy handling of overhead work.

All necessary tools are provided at the various working levels, and around the walls of the rest of the shop are located a 3-ft. by 10-ft. air-filter cleaning tank, an air-filter draining tank of the same size, a 5-ft. by 8-ft. centrifugal oil purifier, a main electric switch box with 6-ft. by 10-ft. space for battery-charging apparatus suspended 15 ft. above the shop floor, a small engine lathe, drill press, pedestal grinder, 9-ft. by 3-ft. work bench and a tool rack or cabinet. Another work bench, 3 ft. by 10 ft., is provided in the center of the shop, and there is a lye vat tank of substantial size with an open-side rinsing and draining pan. The closed end of the shop is



Covers removed for inspection of the valve rockers and injector nozzles of an Alco-G. E. locomotive

occupied by material storage and there are also lockers and shelves.

When Diesel locomotives, received at the shop for repairs, require wheel or truck changes, they are moved across the transfer table to the locomotive shop where the trucks are removed and replaced by dummy trucks, all other work on the locomotives being performed in the Diesel shop. The only crane facilities provided in the Diesel shop consist of a 15-ft. jib crane equipped with a 1½-ton chain hoist. This is high enough to swing over the tops of locomotives on both tracks. It saves hand lifts of heavy tools and engine parts which are near the limit for manual handling and, of course, the crane is indispensable for moving still heavier materials within its capacity. The jib crane is mounted on a 6-in. post near the center of the center platform. The shop is equipped with air, water and steam lines, and has a welding circuit with convenient outlets.

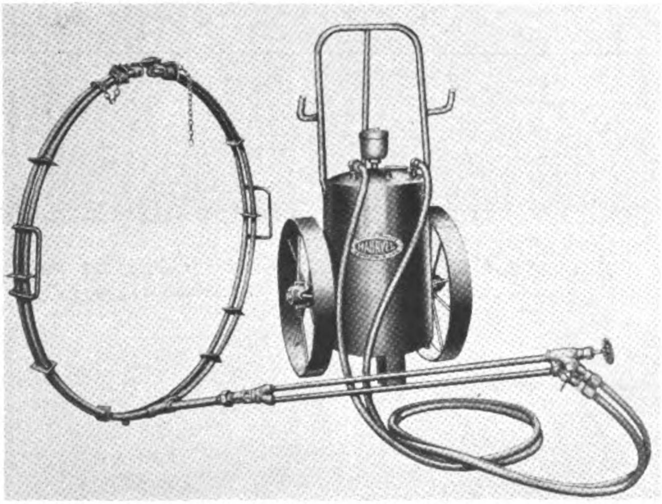
Work done at the yearly inspection, or after 8,000 hours of service, on one class of locomotives, includes the following: Clean carbon and grind valves; rings are changed every other year, or after 16,000 hours of service; return nozzles to manufacturer for adjustment and inspection; check liner wear and give limit if heads are removed; check male fit on cylinder heads with surface plate; general inspection of all parts removed; clean engine thoroughly inside; inspect and clean generator and auxiliary motors; check and clean all electric control equipment; apply high potential test to electric-control equipment (I. C. C. requirement); test main reservoir (I. C. C.); check air compressor and make orifice test (I. C. C.); turn wheels if necessary; remove and clean traction motors when wheels are turned and check bearings for wear and end play; take up slack in throttle and governor linkage installing new bushings and pins as necessary.

Safety Vacuum Type Heating Units

Heating of locomotive tires is readily and safely accomplished by the use of a safety vacuum-type heater placed on the market by the Mahr Manufacturing Company, Minneapolis, Minn. Adjustable rings which distribute heat evenly on the tire surface are attached by a union connection and nipple to the torch which has valves connected to oil and compressed-air supply lines. Opening a valve on the air line which releases air through the burner nozzle creates a vacuum on the oil supply tank when the fuel valve is open. Oil is drawn into the compressed-air stream and atomized, the spray from the nozzle being ignited by waste which is placed between the tire and rings and lighted. The flame can be controlled by the adjustment of the air and oil valves. The important safety feature of the heater is the fact that the fuel supply tank is never under pressure and in danger of exploding.

The same tank and supply line can be used with other type burner nozzles for preheating, thawing, weed burning and other operations requiring intense, directly applied heat.

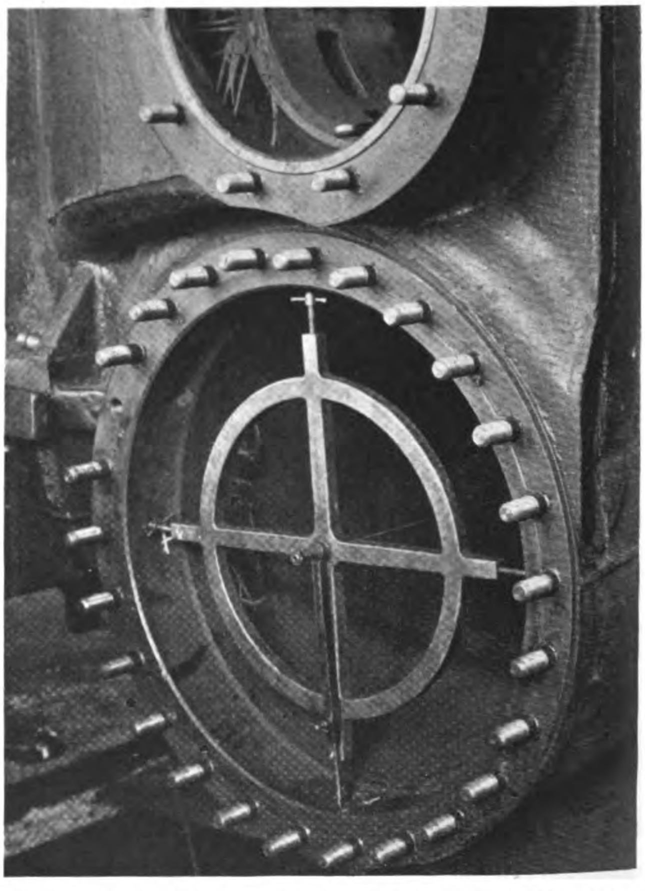
A locomotive fire lighter operating on the safety vacuum principle is also available.



Safety vacuum-type heating unit with adjustable rings

Cylinder Centering Spider

The illustration shows an exceptionally rigid, accurate and easily-adjustable cylinder centering spider. It consists of a circular frame and diagonal cross-bars, made in this instance of aluminum, with four cross-bar extensions which are drilled and tapped to received pointed adjusting screws which make firm contact with the wall of the cylinder bushing. A rotating radius bar, also easily adjustable as to length, enables this spider to be quickly and accurately adjusted to bring the center line at the exact center of the cylinder bushing, where it is positively held in the correct position during all subsequent guide lining operations.



Cylinder centering spider which is easily adjustable, accurate and convenient to use

This device, like all good tools, costs something to

make but is greatly superior to the make-shift devices frequently used for this purpose. With the present scarcity of aluminum, other materials can doubtless be used but a good mechanic always likes to handle tools which are made as light as practicable, consistent with strength and accuracy.

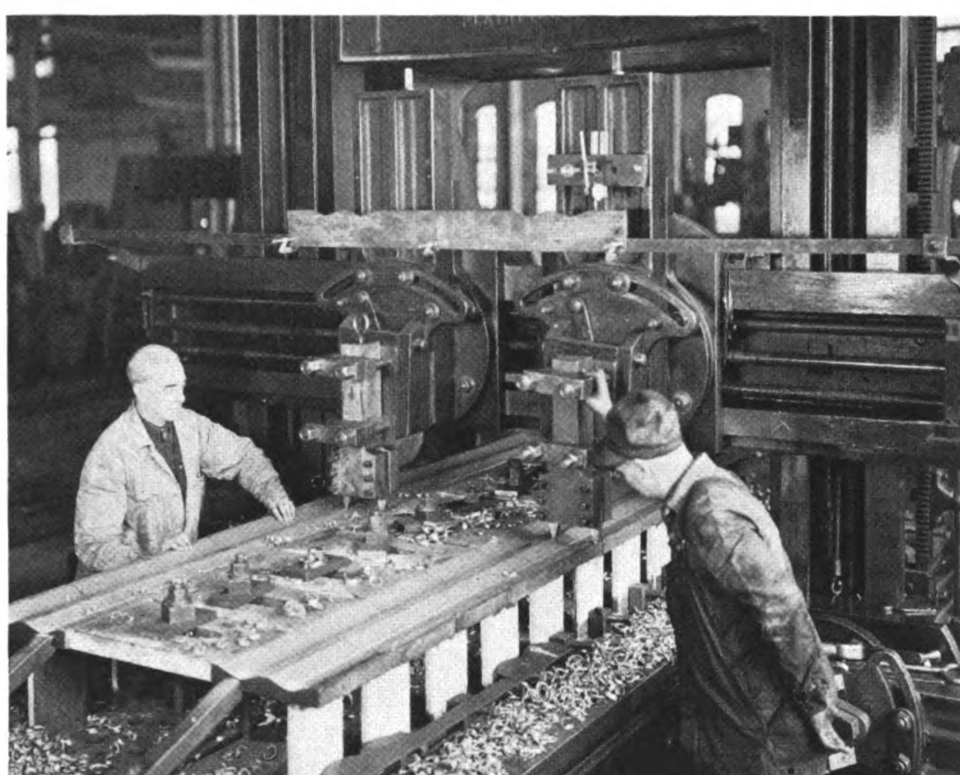
Template for Planing Trailer-Box Roller Caps

By W. G. Corbett

In the February *Railway Mechanical Engineer*, one of the operations described was the machining of Devoy trailer-box roller caps. This job was previously handled one at a time on a frame slotter at the Milwaukee shops of the Chicago, Milwaukee, St. Paul & Pacific. Eight of these are now machined on a planer, four vees being cut all at one time, as shown in the illustration, using two tool holders with two tools in each. The holders are machined so that the tools, 1¼ in. by 1¼ in. by 7 in., can be set 6 in. apart, which is the center spacing of the vees. A template is then made to blueprint dimensions from plywood, ¾ in. thick, which is used to lay out the pieces to be machined, with the vees located correct distances from the uprights.

A horizontal bar is fastened to the cross rail, set far enough out from the faces of the heads on the rail to clear. The horizontal template is then clamped to the bar properly and centered over the work and the tools all set the same height and correctly spaced for cutting. When the tools are fed in the required amount for cutting, a dial gage, which is fastened on the front of one of the heads most suitable for the vision of the operator is set to register zero. It is good practice to set the dial indicator so that it has made one complete turn so as to be sure there is some tension on the dial, then set on zero. The cross feeds are engaged and as the figure on the dial gage will change while feeding across, the down feed which is done by hand will be kept on zero at all times until the cut runs out.

This job is performed more accurately by the new method and with a saving of 60 per cent in machining time. This same method of using templates and a dial indicator works well in machining large dies and planing engine-lathe and planer bases, beds and parts.



Multiple planing operation on eight Devoy trailer-box roller caps at Milwaukee shops of the C.M.St.P. & P.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Welding Cracks Near Staybolts

Q.—A crack has developed in the low-water-alarm connection on one of our Mikado type locomotives. The connection is located in the third course and is in the staybolt area. Due to the fact that the crack is located in the staybolt zone, is it satisfactory to repair it by drilling a hole at the end of the crack, veeing out the crack for its entire length and welding it?—F. H. M.

A.—Welding repairs on locomotive boilers are permitted only where the strength of the structure is not dependent upon the strength of the weld. In computing the strength of the third course, the staybolts are not

considered as supporting the shell and, therefore, the staybolt area cannot be considered as self-supporting as in the case of the firebox side sheets. Any crack in the shell of a locomotive boiler should be repaired with a properly designed riveted patch.

Function of Feedwater-Heater Steam Valve

Q.—What is the purpose of the live-steam valve used in connection with the feedwater heater? Is it a necessary part of the feedwater heater? How does it function?—R. I. M.

A.—The live-steam valve is used to furnish live steam to the feedwater heater when exhaust steam is not available. Without the use of the live-steam valve the feedwater heater and feedwater pump could be used to advantage only at such times as the locomotive was in operation due to the fact that the feedwater is heated by the exhaust steam from the cylinders. To operate the feedwater heater and pump when the locomotive is not in operation would cause cold water to be delivered to the boiler to the detriment of the boiler.

The live-steam valve is composed of a main steam valve and a pilot valve. The main steam valve is held to the seat by a spring and by boiler pressure. It is opened by steam flowing through the pilot valve and taken from the feed-pump steam line between the pump throttle valve and the pump, thus the main valve controlling live steam into the feedwater heater, is opened only when the pump is in operation.

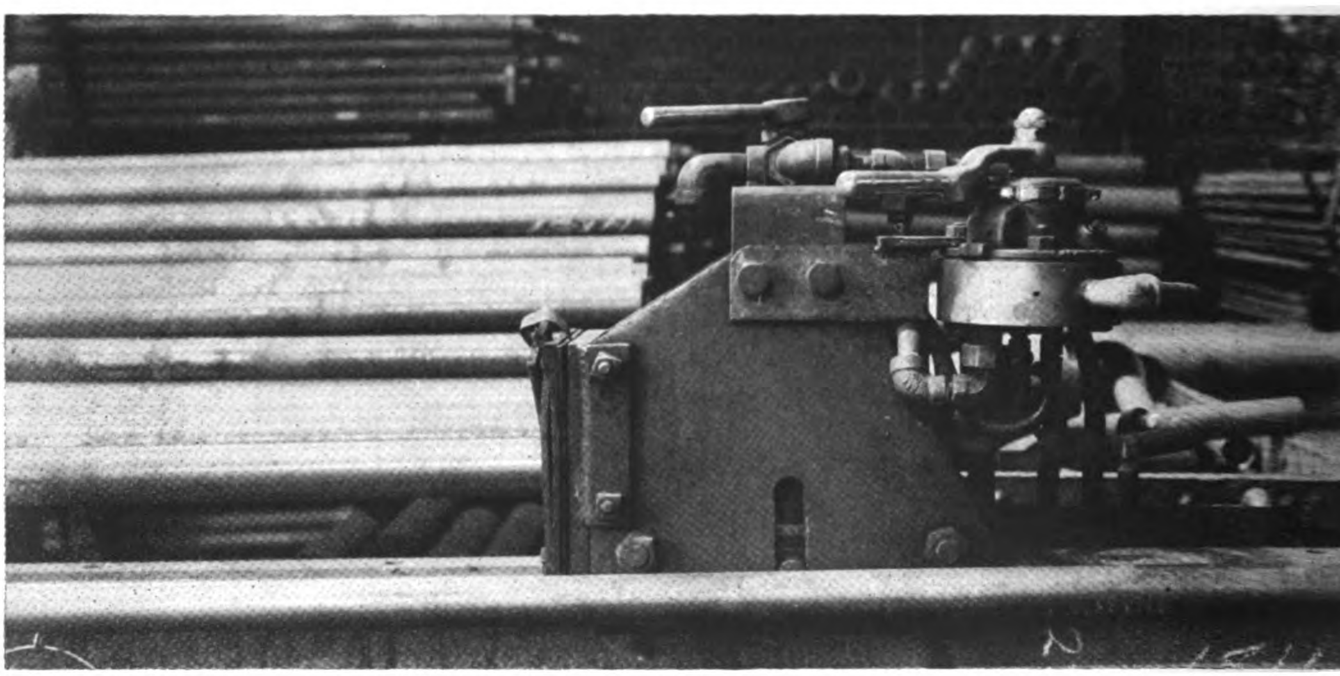
The pilot valve controls the flow of this pump steam to the main valve and is in turn controlled by the main steam-pipe pressure of the locomotive by piping it to the chamber above the pilot valve. A spring below the valve is normally set so that the valve operates at 75 lb. steam-chest pressure, thus a pressure of over 75 lb. in the steam chest shuts the pilot valve which in turn closes the main valve.

If the pump is started with the throttle shut off, the pilot valve is open and allows pump steam to flow to the main valve, opening it and passing live steam into the feedwater heater.

If the throttle is then opened up, the pilot valve closes due to the pressure overcoming the spring in the pilot valve, the steam trapped between it and the main valve is vented to the feedwater heater body through a $\frac{1}{8}$-in. choke, allowing the main valve to close, cutting off the supply of live steam from the boiler to the heater. If the pump is started when the engine is working, the pilot valve, being closed, prevents the flow of steam to the main valve. The live steam valve is not a necessary part of a feedwater-heater system but is used to increase the efficiency of feedwater-heater systems, that now operate utilizing exhaust steam only.

Air-Operated Flue-Testing Machine

The air-operated right head of a flue-testing machine, used at the Louisville & Nashville boiler shop, South Louisville, Ky., is shown in the illustration. Safe-ended tubes and flues roll to this machine in the usual manner and are tested by one man using soapy water applied with a brush over the weld after each flue has been filled with air at the shop line pressure. Tubes and flues which pass the test roll on through the machine into a portable floor rack provided for each locomotive and the occasional flue which shows a defective weld is lifted by a pair of air-operated arms which throws it into a rack of defective flues.



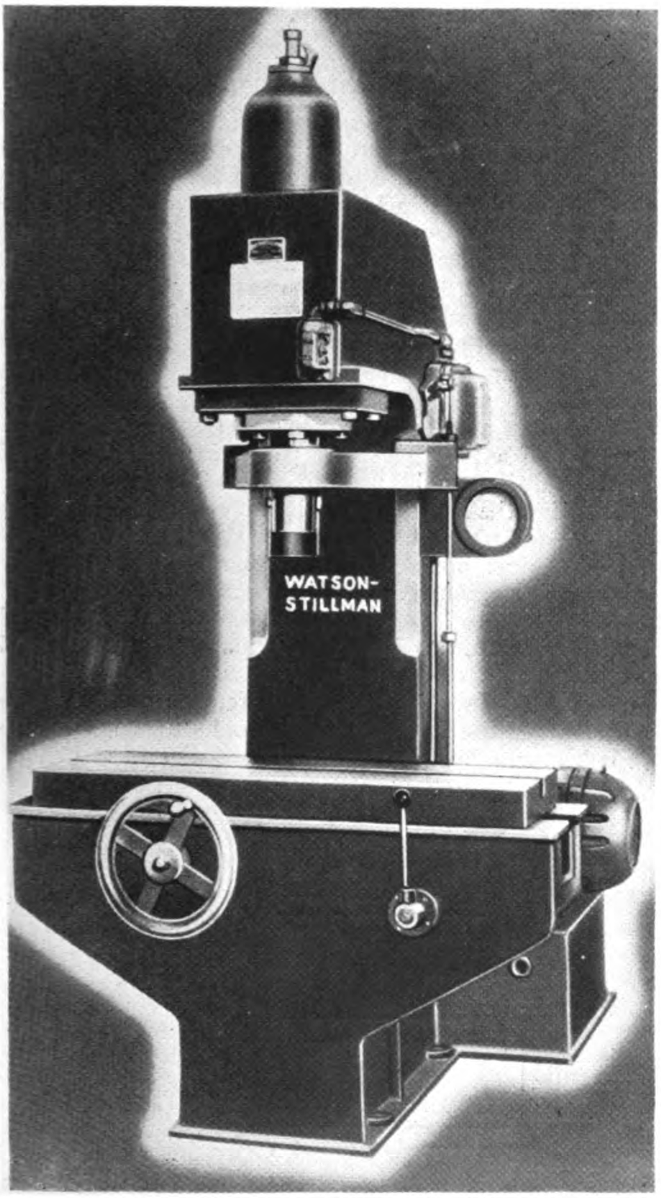
Air-operated flue tester used at the South Louisville boiler shop

The flue tester head is adjustable back and forth on the ways of the testing machine to accommodate flues of different lengths and, after a flue is rolled in place ready for testing, the first movement of the brake valve operating handle clamps the head of the tester solidly in position. The next movement of the operating handle admits air to a small cylinder on the left end of the testing machine and forces the flue up against the main head rubber gaskets, shown in the illustration. The piston rod of the operating cylinder is hollow and supplies air to the flue at shop line pressure and sustains this pressure while the soapy water is being applied to test the welds.

Release of the air pressure by another movement of the brake-valve handle quickly withdraws the left-hand piston and permits the flue to roll through the machine and drop into the rack of tested flues. Operation of a foot treadle releases a trip which permits the next tube or flue to roll into place in the testing machine. The ejecting arms for removing defective flues are operated by a three-way air cock, as shown in the illustration. The head of the testing machine travels on ball bearings so arranged that they do not carry the weight of the head when clamping pressure is applied.

Straightening Press of 50 Tons Capacity

A new model 50-ton straightening press adaptable for use in straightening rods, bars, tubes and structural shapes is being manufactured by the Watson-Stillman Co., Roselle, N. J. Using a manually movable table four feet long and 14½ in. wide with a 24-in. travel, quick and accurate positioning of the work is possible.



Straightening press of 50 tons capacity for rods, bars, tubes and structural shapes

The machine has a 20-in. opening, a 14-in. stroke and a 12-in. gap. Advance speed is 109 in. per minute, pressing speed 18 in. and return 90 in. Operation is by an oil gear pump driven by a 5-hp. motor and sensitive control is governed by a single hand lever.

Using Carbide Tools On Large Machines

By Fred W. Lucht*

Until recently there was little interest in the idea of applying carbide tools to large machines such as boring mills, large vertical turret lathes, engine lathes, etc. Not only were such large machines rarely run on a continuous basis, but most of them were old types, designed for low-speed cutting (25 to 30 ft. per min.), were insufficiently powered to use carbides, and lacked the rigidity required for higher-speed operation.

Today the situation is different. Many a large machine is on the critical list. Production on such machines has had to be stepped up under pressure. It is not surprising, therefore, that there is a sharp increase in the use of carbide tools on large machines.

Fundamentally, there is no reason why carbide tools cannot be applied successfully to most large machines, particularly those of the newer designs. These later machines are built with greater rigidity and for higher cutting speeds than their earlier prototypes and are usually higher-powered.

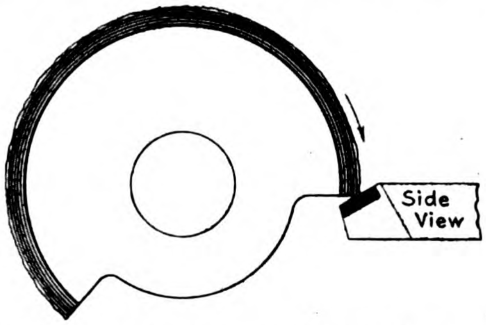


Fig. 1—Sketch illustrating the "shear" cut obtained with the newer negative rake Carboloy tools now used on machining large work with interrupted cuts. Impact load is not concentrated on point of tool

Carbide tools were originally used only on cast-iron and non-ferrous machining operations and, even on these materials, they were restricted to continuous cuts for a long time after their introduction. It was widely believed that they lacked sufficient strength to handle interrupted cuts. When carbide tools were tried on such cuts, tool breakage sometimes occurred. Tool-breakages were also caused by sand in the castings, big run-outs, heavy scale, etc. Now this picture has changed completely and carbide tools take the whole gamut of interrupted cuts, even the harder and tougher steels.

Among the factors which have contributed to broadening the use of carbide tools on large work and large machines generally are:

1—Vastly increased knowledge of proper speeds and feeds as well as improved clamping fixtures, rigid tool holders, etc.

2—Better determination of shank and tip sizes required for handling heavy cuts.

3—Increased knowledge of tool shape and cutting angles. For

* Engineer, Carboloy Company, Inc.

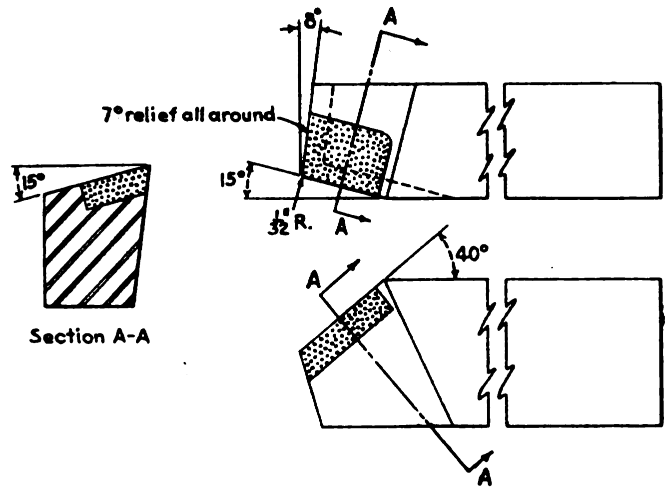


Fig. 2—Carboloy tool with extreme negative rake used to obtain a "shear" cut. This tool is best suited to roughing cuts on large diameters. It is not recommended for most finish cuts because the chip curls toward the work and spoils the finish

example, the development of negative back-rake-angle tools. In some instances these negative back rakes have been carried to an extreme degree to obtain a shear type of cut. (See Figs. 1 and 2.) The tools are so designed that the impact following an interruption is minimized by gradual entry of the tool into the cut, since with a negative back rake the initial load is taken back away from the nose of the tool.

4—The general adoption of centralized grinding in the tool room for reconditioning single-point tools as well as reamers, drills and other end-cutting tools. Centralized grinding assures proper grinding of the carbide tools by trained grinder hands and at the same time saves costly time which is lost when the machine operator takes time out to grind his own cutting tools.

Another factor responsible for the increased useage of carbide tools on large machines is the ability, today, of shops to produce their own carbide tools by tipping shanks with lower priced Carboloy tips, reducing costs, avoiding delays, decreasing tool salvage loss, etc.

On the whole, however, the question goes back to greater knowledge of the problems involved in applying carbides to large machines. It has been only in recent years that there has been sufficient interest along these lines to permit devoting considerable time and effort to the problem on the part of both the user and the tool manufacturer.

The advantages of the use of carbide tools on large machines may be summarized as follows:

1—Increase of cutting speed permits a reduction in feed, insuring better finish, without reduction in metal removal. Since higher cutting speeds go hand in hand with maximum efficiency and output, the machines should be capable of running at speeds about twice those normally used with high-speed steel.

2—The use of lighter feeds permits the use of lighter fixtures, of simpler design and lower cost, which are quicker to build. Best results were obtained when the feeds were held below .030. The lower feeds as compared with high-speed steel practice were in practically every instance more than offset by the higher cutting speeds employed.

3—With lighter fixtures, lighter, thin-wall parts can also be machined more effectively and quicker. Parts do not have to be chucked or fastened as securely, thus avoiding distortion.

4—Carbide tools usually provide longer tool life per grind, reducing down-time, set-up time, etc. Shanks must be large enough to take care of the tool overhang which is frequently of considerable magnitude on large boring mills. Charts are available for selecting correct shank and tip proportions.

5—Carbide tools permit the ready machining of harder materials, such as armor-plate castings and forgings and heat-treated alloy steels of 300 to 500 Brinell hardness.

6—Operators turn out more work with less effort because they do not have to replace and grind tools so often, nor check as often for changing dimensions due to tool wear. A centralized grinding room is an important factor in obtaining maximum performance of both machine and cutting tool.

In putting carbide tools to work on large machines we have frequently found that the advantages gained far exceeded the results attributable to carbide tools alone. Many large machines are operated on the basis of antiquated practices handed down from year to year and from decade to decade.

The mere introduction of a new element, such as carbide tools, has, in many cases, permitted reorganizing machining practice in a manner which would have been difficult to accomplish without the introduction of a relatively new and unknown factor.

Prime among shop-practice improvements along this line have been the following: (1) Planned cutting; (2) adoption of tool-setting devices for quicker set-up and, (3) greater usage of machine dials as a check on cutting.

Planned cutting means nothing more than changing the order of cuts, etc., in order to remove stock in the fastest way. It is surprising how little deductive reasoning is applied to this question in some plants—such as the rough facing of a part before turning to reduce the excessive run-out of the work (see Fig. 3). This may not only reduce the travel of both the turning and boring tools but will also enable them to start the cuts in clean metal instead of rough scale, allowing the tools to hold size better and tending to reduce the floor-to-floor time because of less time required for changing dull tools. In some cases, with carbide tools, we have found it possible by planned cutting to reduce machining time by many hours. Cutting a 30-hour machining job down to 8 or 10 hours by such simple expedients is no longer regarded as unusual.

The adoption of some form of tool-setting devices for quicker set-up is another factor which can contribute materially to greatly increased output. It's not a bad idea to adopt a "get rid of calipers" slogan. Indicators, simple tool-setting gages as part of the fixture, and machine dials may be used to speed tool set-up.

Checking the machine-dial setting when changing tools provides a surprisingly accurate method of speeding tool setting. Most operators don't trust these dials, based on experience with older, less accurate machines and dials. The use of ground lead screws, accurately marked dials, etc., on most of the newer machines has changed the situation.

On some jobs, where chip interference does not prevent, another useful trick to speed tool setting is to clamp an indicator permanently on the cross-slide.

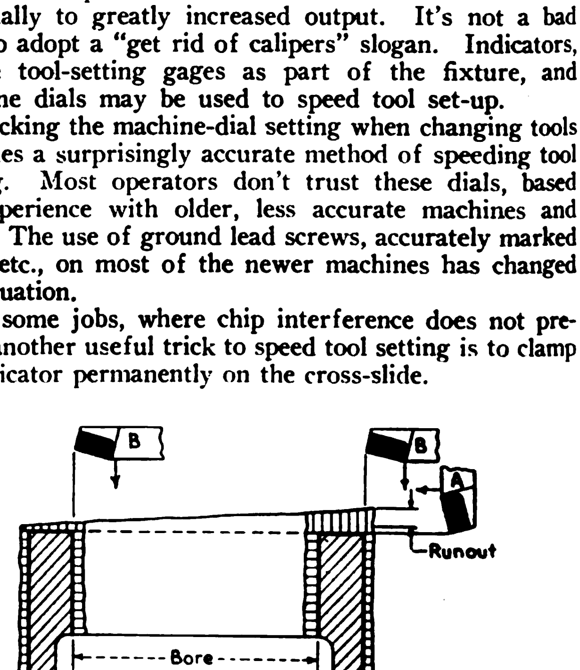


Fig. 3—Tool A takes facing cut removing scale and runout on back of casting. Tools B then take turning and boring cuts. This practice enables tools B to hold size better throughout entire length of cut since they start in clean metal

High Spots in
Railway Affairs . . .

Railroad Employment

According to the Interstate Commerce Commission railroad employment in June was up 11.83 per cent over June of last year. There were 1,292,595 employees in mid-June. Train and engine service increased 14.87 per cent; professional, clerical and general, 13.3 per cent; yardmasters, switch tenders and hostlers, 13.01 per cent; maintenance of equipment and stores, 11.42 per cent; maintenance of way and structures, 10.91 per cent. These figures, however, do not reflect the real seriousness of the employment situation. The railroads have lost or are losing many experienced and valuable employees. As a result, attention as never before is being concentrated upon employment methods and special refresher and training practices. In this latter respect much can be learned from the programs inaugurated under the direction of the Training Within Industry Branch of the Labor Division of the Office of Production Management, of which Channing R. Dooley is chief. Among the practices now followed by some railroads in the effort to maintain their forces are the holding of employees in service beyond retirement age, calling back men from retirement, employing men well beyond the age limits specified under normal conditions, hiring physically handicapped for work to which they are suited, and the hiring of women for tasks not considered within their realm under normal conditions.

Transport Board Life Extended

The Transportation Act of 1940 provided for the creation of a Board of Investigation and Research to study our transportation problems and make recommendations for their solution in the public interest. It was hoped that an able and unbiased board would quickly be selected and that it would make real headway on one of the most complicated and vital problems involved in our national economy. It was specified that it would have a life of two years from the enactment of the law on September 18, 1940. For one reason or another, the board was not appointed promptly and it did not assume office until August 22, 1941, or very nearly a year after the enactment date. Obviously, it is not now prepared to present a final report and the President on June 26 issued a proclamation extending its life for two years, or until September 18, 1944. The proclamation included the statement that "an efficient transportation system is essential to the nation in peace and war, and the national interest requires the development of informed policies by which such a system may be promoted, strengthened and maintained." The question now is, are the men on the board big enough to do the job and will their recommendations be available in time to be of value in the postwar period, with all the readjustments that will be required to adapt our transportation facilities to peacetime conditions.

Travel Habits Changing

Gasoline rationing in the East and the effort to conserve rubber by restricting travel promise to bring about a marked change in the living habits of many of our people. It is rather difficult, however, to change American habits quickly and the resources of the railroads were strained to the limit by passenger travel over the July 4 holiday weekend. This was in spite of the fact that O. D. T. Director Eastman indicated that "a patriotic way to observe the Fourth of July this year" was "to dispense with needless travel." The railroads did what they could to co-operate with Director Eastman, and for the first time in many years no special July 4 excursions were operated to or from any of the large eastern cities. Moreover, the railroads in their advertising urged the public to make allowances for crowded conditions and, if possible, to avoid the peak periods. Undoubtedly this did discourage great numbers of people from traveling over the holiday weekend. In spite of it all, railroad travel assumed record-breaking proportions, although highway traffic was much less than usual and highway accidents over the holiday were greatly reduced, as compared with previous years.

Daniel Willard

Seldom has the passing of a railroader attracted such nationwide attention and comment as that of Daniel Willard, chairman of the board of the Baltimore & Ohio. A great railroad executive—he had fought his way from the bottom and was thoroughly familiar with all departments of railroading—he was held in the highest esteem, not only by the men in his own organization, from the top to the bottom, but by railroaders generally and by governmental administrators as well. A man of keen human sympathies, he visioned as his ideal the practical application of the Golden Rule. Labor leaders trusted him and several times in national transportation emergencies he was an important factor in assisting labor, managements and public authorities to compose their differences. It is not to be wondered at that the labor union-management co-operative plan established on the Baltimore & Ohio many years ago proved so successful. In spite of his advanced age, as chairman of the board he continued to follow closely many of those activities in which he had been specially interested. He carried cards in his wallet with up-to-date statistics about them. One of these included, in compact form, facts about the suggestions made by the co-operative committees and what disposal had been made of them. Always, however, he insisted that these accomplishments had been made possible because of the spirit of mutual trust and reliance that dominated this activity. Many people smiled indulgently at Donald Nelson's advocacy of labor-management committees in war production plants, with the objective of increasing production. C. J. Symington (see page 336) and Daniel Willard had never compared their experiences in the co-operative movement, but it is significant that both of them ascribe the same underlying or fundamental reasons for the success of their projects.

Integrated Transportation

A chief executive of a railroad who frequently comes in contact with shippers is careful in discussing business with them to avoid the use of the word railroading, and to speak in terms of transportation. Naturally he is keen to protect the interests of his own road, but he has found, in the long run, that it does not necessarily mean that he must strive to get the longest possible haul over his road for the shipments. Sometimes, by being content with a shorter haul, the railroad can combine with other types of carriers in such a way as to give better service to the shipper, and in the final analysis the railroad may secure a greater amount of business on a ton-mileage basis. So far as the public authorities will permit, there has been a growing tendency for many years to coordinate transportation activities. The railroads today, for instance, operate a great number of highway trucks and buses, either by direct ownership or by contract. They were in normal times one of the best customers of the automobile manufacturers. Donald D. Conn, in testifying before the Board of Investigation and Research, advocated that the transportation companies should be integrated now, during the war period, and "must not await the uncertain repercussions of a post-war period of readjustment." He defined integration as "the working together of all forms of transport for a mutual advantage and a composite service to the public." If some real generalship is not exercised in this direction it is to be feared that the overdevelopment of special types of transportation after the war may bring about an unbalance that may cost the public dearly in the end.

NEWS

Gray Becomes Brigadier-General

Col. Carl R. Gray, Jr., has been promoted to Brigadier-General continuing in charge of the Military Railway Service, with headquarters as before at Ft. Snelling, Minn.

Brigadier-General C. D. Young Returns to ODT

Brigadier-General Charles D. Young, director of procurement and distribution, Services of Supply, War Department, was returned to inactive status on June 30, having reached the Army's statutory retirement age. General Young, a former vice-president of the Pennsylvania, has returned to the Office of Defense Transportation as an assistant director, functioning as liaison on matters of material and equipment between ODT and the Transportation Service of the Services of Supply, and between ODT and the War Production Board. At the time of his call to active service, he was director of ODT's Section of Materials and Equipment.

During his tour of active duty General Young served with the Supply Division (G-4) of the War Department General Staff until last March's reorganization when he became director of procurement and distribution in the Services of Supply.

Master Boiler Makers to Hold "Convention in Print"

Although the Master Boiler Makers' Association had anticipated celebrating its fortieth anniversary by holding a regular meeting of members, in compliance with the request of the Mechanical Division of the A. A. R., it has called off plans for such a meeting. The annual proceedings of the Association will be published based on committee reports submitted after a study of the replies received to questionnaires forwarded to every leading railroad of the country. It is hoped that complete cooperation will be given by railroad officers to whom these questionnaires have been sent. The Mechanical Division of the A. A. R. has approved the choice of subject matter.

Six topics have been selected for study and reports. The first covers general prevention of cinder cutting of locomotive boilers. Application and maintenance of flues, tubes, and arch tubes with special relation to the use of copper ferrules and of welding will be discussed in the second paper. Topic three is concerned with the chemical treatment of boiler feedwater and the use of terminal and line-of-road blowdowns. A study of defects in boilers carrying 200 lb. and over 250 lb. pressure will be made in the fourth paper with particular reference to the nature of defects developed, the materials used in construction, plain carbon steels or alloys, age of boilers and pressures at which defects develop, the effect of different fuels, and general methods of repair. Topic five is related to topic four in that it will include recommendations of the latest methods being used in the fabrication of boilers made of iron, steel and alloy materials. The last paper will deal with the methods of reclamation, conservation, and substitution being practiced on boiler materials.

Beyer on Manpower Commission

Otto S. Beyer, director of the Office of Defense Transportation's Division of Transport Personnel, has been appointed to membership on the War Manpower Commission, according to a recent announcement from WMC Chairman Paul V. McNutt. Mr. Beyer will represent ODT and the War Shipping Administration.

A. A. R. Conservation Drive

"An intensive campaign to conserve material and reclaim every bit that can be salvaged so that our armed forces may be supplied with arms and equipment is being conducted by the railroads of this country," said a July 15 statement from the Association of American Railroads. The Purchases and Stores Division, in cooperation with the Mechanical and Engineering Divisions, have just revised and sent to member roads instructions as to the reclamation of materials by recovery and repair covering a much wider scope than ever before.

Leaflets and posters carry the "Don't waste anything" campaign to all railroad employees in a five point program—"conserve, convert, use it up, make it do, and save the pieces."

More than 700 definite recommendations have been listed by the divisions for recovery and repair of materials. Based upon a "thorough study of the practices in use on various railroads, revised according to actual results obtained," these recommendations cover practically every article used by the railroads, ranging from discarded linen from dining cars and hair taken from seat cushions to steel rails and locomotive axles. Special attention is paid in the new instructions to substitutes for rubber, and the marketing of rubber scrap. Equal stress is placed upon scrap metal which, the railroad salvage campaign declares, is today "precious metal."

ODT Rail Transport Staff Appointments

Two recent appointments to the staff of the Division of Railway Transport, Office of Defense Transportation, include the assignment of Shannon Kuhn to the position of locomotive assistant, specializing in locomotive repair problems, in the Mechanical Section; and of Frank J. Swanson as service representative in the Mechanical Section. Mr. Swanson, who has been supervisor in the Chicago, Milwaukee, St. Paul & Pacific's car department at Chicago, will visit car builders and railway shops to aid in facilitating car building and repairing. Mr. Kuhn comes to ODT from the position of general foreman in the Cleveland, Ohio, shops of the New York Central.

Malleable Iron Parts For A.A.R. Valves

As a result of discussion between representatives of the government, various manufacturers, and the A. A. R. Mechanical Division, Executive Vice-Chairman V. R. Hawthorne reports in a letter to members of the Division that malleable iron was agreed upon as a possible substitute for brass in certain parts of globe and angle valves. Some sample valves of the A. A. R. standard design were made up with bodies and bonnet union rings of malleable iron. These valves were subjected to severe laboratory tests in comparison with corresponding all-brass valves. In these tests, "the malleable iron valves withstood various physical tests, such as hydrostatic pressure, the application of piping strains, excessive torque on the handwheels and severe thermal shock, as well as or better than the brass valves."

On recommendation of the Committee on Locomotive Construction, the General com-

(Continued on next left-hand page)

Orders and Inquiries for New Equipment Placed Since the Closing of the July Issue

Road	No. of Locos.	Type of Locos.	Builder
		LOCOMOTIVE ORDERS	
Central of Georgia	1	1,000-hp. Diesel-elec.	Electro-Motive Corp.
Denver & Rio Grande Western	6	44-ton Diesel-elec.	General Elec. Co.
		FREIGHT-CAR ORDERS	
Chicago & North Western	25[1]	70-ton flat cars	Company shops
Denver & Rio Grande Western	550	Gondola	Pressed Steel Car Co.
	450	50-ton gondolas	Mt. Vernon Car Mfg. Co.
Lehigh Valley	1,000[1]	Hopper	Bethlehem Steel Co.
Missouri Pacific	650[1]	Gondola	Pressed Steel Car Co.
		FREIGHT-CAR INQUIRIES	
National Tube Co.	30	70-ton hopper	....
Utah Copper Co.	100	100-ton ore	....

[1] Release received from the War Production Board.

mittee has approved for general locomotive use, except for steam and water lines inside the cab, valves of A. A. R. standard design with certain parts made of malleable iron as set forth in a specification which will be inserted in the Manual of Standard and Recommended Practices to govern the manufacture of A. A. R. standard valves for general locomotive use, except as stated above, for the duration of the war.

This action is taken with the full knowledge of the Bureau of Locomotive Inspection, I. C. C., which has ruled that "inasmuch as these valves will not be located inside locomotive cabs there will be no objection to their use."

A. A. R. Mechanical Division Circulars

Wheel and Axle Manual.—Subsequent to issuance of the 1942 edition of the Wheel and Axle Manual, the Committee on Wheels and the Arbitration committee have recommended, and the General committee has approved, a revision of dimensions appearing in Fig. 106 on page 119. The gap for the flange shown on the right-hand gage as 1 in. is modified to read $1\frac{1}{16}$ in. The gap for the flange shown on the left-hand gage as $1\frac{1}{16}$ in. is modified to read $1\frac{1}{8}$ in. Secretary A. C. Browning requests that the revised manuals be corrected accordingly.

Remount Gage Limits Revised.—In the interest of conserving wheel material, upon recommendation by the Committee on Wheels and the Arbitration committee, the General committee has approved a revision of the following remount gages to become effective July 1, 1942, in a supplement to the current Code of Interchange Rules recently issued. The flange limit remount gage shown at the right on page 155 is revised to decrease the flange gap from $1\frac{1}{8}$ in. to $1\frac{1}{16}$ in., and increase the flange height from $1\frac{5}{16}$ in. to $1\frac{7}{16}$ in., the title being changed to read "Limit Gage for Remounting One Wear Wrought-Steel Wheels." The left-hand gage is revised to decrease the flange gap from $1\frac{3}{16}$ in. to $1\frac{1}{8}$ in., and increase the flange height from $1\frac{5}{16}$ in. to $1\frac{3}{8}$ in., the title being revised to read "Limit Gage for Remounting Cast-Iron and Cast Steel Wheels." The tread limit remount gage on page 157 is revised to increase the $1\frac{3}{8}$-in. dimension to $1\frac{5}{16}$ in., $\frac{1}{16}$ in. also being added to the projection and the title changed to read "Tread Limit Remount Gage for Cast-Iron and Cast-Steel Wheels." The tread-worn hollow gage on page 151 is revised in title only to read "Tread-Worn Hollow Gage—Condemning Limit for Cast-Iron and Cast-Steel Wheels."

Stevens Institute Scholarship.—Recognizing the increased need for technically-trained men, the A. A. R. Mechanical division has called attention again to its special scholarship award at the Stevens Institute of Technology, amounting to a total value of $1,200, which will be available this September and is offered to the sons of members of the Division. This scholarship was established in 1891 and those who have won it in the past 51 years have in many cases attained positions of distinction in the engineering profession. The student designated for this scholarship will receive the benefit of the sliding scale of tuitions at the Stevens Institute of Technology, Hoboken, N. J.

Kelly Succeeds Hollar

Warren W. Kelly, associate director of the Office of Defense Transportation's Section of Materials and Equipment, has been appointed director, succeeding Philip A. Hollar who has been acting director since March. Mr. Hollar, who was formerly assistant stores manager of the Pennsylvania, has returned to the Association of American Railroads as special representative of the Operations and Maintenance Department, the position he was holding when he joined the ODT staff.

Mr. Kelly, former general purchasing agent of the Atchison, Topeka & Santa Fe, came to ODT in June.

C. W. Brown has been appointed assistant director of the Section of Materials and Equipment. He has been with ODT since February, and was formerly associated with the federal coordinator of transportation.

Hill Becomes Inter-American Equipment Consultant

Major Howard G. Hill, who has been assistant to the chief of the railway section in the office of the chief of engineers, at Washington, D. C., since August 1, 1940, has been promoted to the rank of Lieutenant Colonel, transferred to the Executive Office of the President, and assigned to the Office of the Co-ordinator of Inter-American Affairs as railroad equipment consultant. He has been detailed as chief of a special mission to investigate the condition of motive power and rolling stock, shops, track and operating methods on the National Railways of Mexico, including both standard and narrow-gage lines. Colonel Hill began his railroad career as an apprentice machinist on the Southern Pacific's Texas and Louisiana lines, in August, 1914. Subsequently he served in turn as draftsman, inspector, instructor of apprentices, locomotive fireman, brakeman and mechanical engineer in charge of locomotive valuation work. In 1920 he joined the Texas Corporation and was associated with that company for 14 years as machine designer, lubricating engineer, and engineer of tests, principally in connection with railway equipment lubrication tests and development work on railroads. He became associated with the Hennessy Lubricator Company, New York, in 1935 as sales and service engineer for western and southwestern states, and specialized in railway equipment lubrication until being called into army service in August, 1940. While in the office of the Chief of Engineers, Colonel Hill prepared specifications for a large amount of military railway equipment now being built for the War Department.

Lt. Col. Howard G. Hill

"Blackout Coach"

A coach equipped for safe "blackout" travel according to specifications prepared by the Association of American Railroads has been put on exhibition at the principal stations of the Reading.

Alterations to the car closely follow standards developed in England under actual air-raid conditions. The edges of all windows have been painted with a black band four inches wide, so that light around the sides of drawn shades will not be visible from outside. The paint is applied on the outer side of the glass to prevent its removal by passengers. Glass in end doors and vestibules is painted solid black except for a one-inch peephole.

A resistance placed in the lighting system permits the car lights to be dimmed during blackouts by reducing the voltage from 32 to 9 volts. It is estimated that cars could be equipped to meet A. A. R. requirements for about fifty dollars each if such operations were undertaken on a large scale.

A Few Mechanical Advisory Reports Still Available

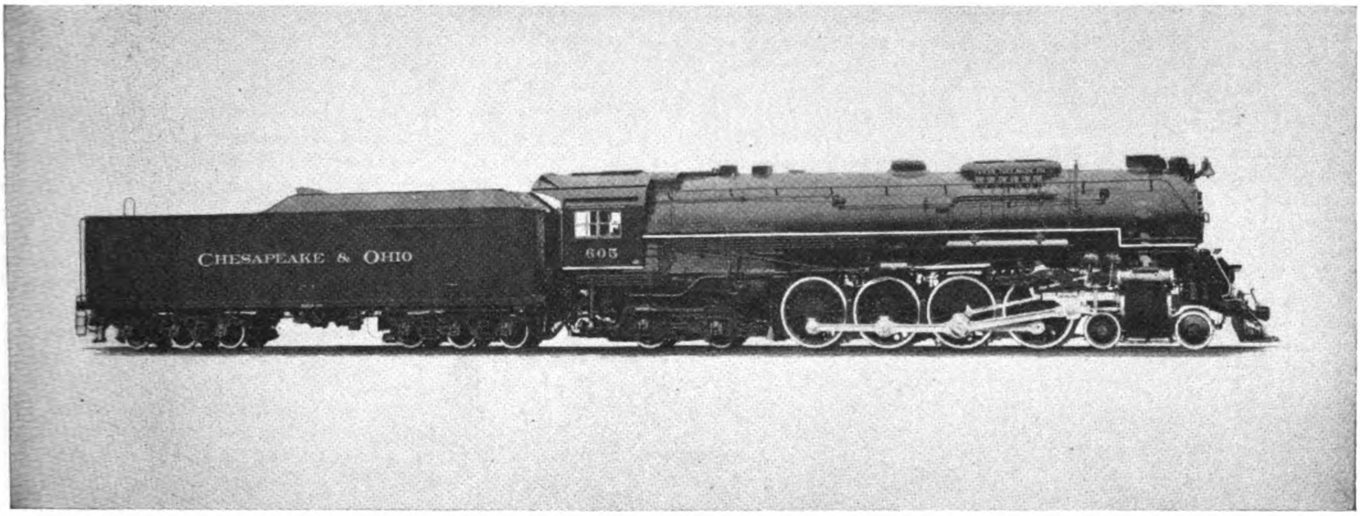
In order to dispose of the few remaining copies of the report of the Mechanical Advisory Committee to the Federal Co-ordinator of Transportation, issued in 1936, Secretary A. C. Browning advises that this report will be sold to members and non-members at a special price of $3 a copy plus shipping charges until the supply is exhausted.

Also a small supply of the following reports is still available: Tests of Trucks and Truck Springs, December, 1937; Air-Conditioning of Railroad Passenger Cars, April 15, 1937; Road Performance of Air-Conditioned Pullman Sleeping Cars, October, 1937; Relative Performance of Air Filters, January 15, 1938; Impact Tests of Light-Weight Box Cars, October 1, 1937; Comparative Impact Tests of Pullman Light-Weight and A. A. R. Standard Box Cars, February, 1938; Second, Third, Fourth and Fifth Progress Reports Covering Passenger Axle Car Tests, June, 1941; A. A. R. Passenger Locomotive Tests, February, 1939; Tests of Trucks for High-Speed Freight Service, April, 1940; Failures and Performance of Main Crank Pins on Steam Locomotives, May, 1940; Determining Counterbalance Effects by Rail Stress Measurements, January, 1941.

(*Turn to next left-hand page*)

★ ★ ★ ★ TIME and TONNAGE ★ ★ ★ ★

are the important considerations



Maximum gross-ton-miles per-train-hour are becoming increasingly important as America's war effort slips into high gear. The only power that can meet today's demands for heavier loads moved at steadily reduced running time is . . . MODERN SUPER POWER.

Lima has pioneered in the construction of this type of steam power, and is prepared to build locomotives of the latest design to help you to . . . "KEEP 'EM ROLLING."

LIMA LOCOMOTIVE WORKS — LIMA LOCOMOTIVE WORKS INCORPORATED — INCORPORATED, LIMA, OHIO

Letter Ballot Return

The Secretary of the Association of American Railroads, Mechanical Division, reports a favorable return on letter ballots submitted to the membership in Circular D.V.-1033, on May 18, 1942. One of these ballots pertains to modifications in the recommended instructions governing the operation of passenger cars in freight trains, these modifications being recommended by the Committee on Brakes and Brake Equipment. Similarly, the recommendations of the Committee on Car Construction in connection with definitions and designating letters for cars was approved; also the recommendation from the Committee on Specifications for Materials to modify Specification M-116-steel, structural shapes, plates and bars. All of these recommendations have been approved, effective immediately.

Shopmen Give Up Vacation Time, But Get Pay

Approximately 7,000 shop employees of the Chesapeake & Ohio have agreed to forego vacations this year, it was announced recently, in order to keep operations going at full speed during the present emergency. The railroad management has agreed to pay them at the regular rate for the vacation time they are giving up, in addition to the wages they earn at work during the period the vacations would have covered.

Equipment Purchasing and Modernization Program

Canadian Pacific.—The Canadian Pacific has awarded a contract to G. A. Baert, St Boniface, Man., for an extension of 25 ft. to nine stalls of the enginehouse at Winnipeg, Man., to make the stalls 120 ft. long; the construction of a new fan room 30 ft. by 38 ft. of concrete and brick, and a new staff building 52 ft. by 98 ft. of similar construction. The staff building will be heated by steam radiators and unit heaters, and will contain offices for the timekeeper, crew clerk and locomotive foreman; an engineer's locker room; shop lavatory and a mess room.

Chicago & North Western.—The C. & N. W. has asked the Interstate Commerce Commission to approve a plan whereby the trustee of a recent equipment trust will invest some $3,750,000 of the proceeds of the trust dated March 5, 1942, in government bonds until such time as the equipment called for in the trust is available. The company also seeks authority to substitute gondola, hopper, flat or box cars for equipment specifically called for in the equipment trust. The commission was informed that 75 per cent of the holders of the certificates have agreed to the change in the trust.

Missouri Pacific.—Because of a shortage of equipment due to the war needs, the Missouri Pacific has been authorized by Division 4 of the Interstate Commerce Commission to substitute in Finance Docket No. 13481 100 50-ton, 50-ft. all-steel flat cars and 238 50-ton, 40-ft. 6 in. all-steel box cars for 50 covered cement hopper cars and 200 automobile cars. The estimated cost of the new equipment is $1,053,909 as contrasted with $981,167 for the equipment which the company is unable to obtain. The road has also been authorized by the District Court to purchase four 5,400-h.p. Diesel-electric freight locomotives at a cost of $1,920,000.

New York Central.—Because of a shortage of equipment due to the war needs, the N. Y. C. has been authorized by Division 4 of the Interstate Commerce Commission in Finance Docket No. 13341 to substitute certain other equipment for 1,928 55-ton steel box cars costing $5,109,200, and seven Diesel-electric switching locomotives costing $305,032. The company's application told the commission that arrangements have been made for the construction of "substantial numbers" of freight locomotives, switching locomotives, and gondola cars, and that it believes that certain needed hopper and flat cars may also be obtainable. The company will execute additional trusts as soon as it becomes known what equipment will be available. The company also noted in its application that the production of box cars had been stopped by the War Production Board, while the switching locomotives may be allocated by the Office of Defense Transportation to other carriers if the need for such action should arise.

Northern Pacific.—The Northern Pacific has applied to the Interstate Commerce Commission for authority to assume liability for $2,500,000 of equipment trust certificates, series B, the proceeds to be used to finance in part the purchase of 12 freight locomotives of the 4-6-6-4 type at a cost of $3,247,183.

Pennsylvania.—Because of orders of the War Production Board the Pennsylvania has informed the Interstate Commerce Commission that it has been unable to obtain the following equipment recently authorized in Finance Docket No. 13567: 1,107 50-ton steel box cars; 1,989 55-ton hopper cars; 1,000 70-ton gondola cars; 300 70-ton hopper cars; and 50 cabin cars costing a total of $13,392,850. In place of this equipment the company desires to substitute the following new equipment costing a total of $14,270,000: 500 50-ton hopper cars; 500 70-ton gondola cars; 500 50-ton gondola cars; 49 2-10-4 steam locomotives; and five GGI type electric locomotives.

Pere Marquette.—The Pere Marquette has been authorized by the Interstate Commerce Commission for authority to assume liability for $680,000 of equipment trust certificates, maturing in 10 equal annual installments of $68,000 on June 15 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as a part of the purchase price of new equipment costing a total of $869,342 and consisting of 250 70-ton, 53-ft. 6-in. steel-underframe flat cars.

St. Louis-San Francisco.—This company has been authorized by the Interstate Commerce Commission to assume liability for $2,120,000 of equipment trust certificates maturing in 10 equal annual installments of $212,000 on July 1 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as a part of the purchase price of new equipment costing a total of $2,672,228 and consisting of 12 coal-burning, Hudson type, 4-8-4 steam freight locomotives and three oil-burning, Hudson type, 4-8-4 steam freight locomotives.

Seaboard Air Line.—The Seaboard has asked the Interstate Commerce Commission to approve a plan whereby it would issue $2,280,000 of 2¾ per cent equipment trust certificates which would be either sold to the Reconstruction Finance Corporation or guaranteed by it. The proceeds of the issue, which would mature in 20 semiannual installments beginning January 1, 1943, would be used to purchase new equipment costing a total of $3,069,760 and consisting of six 5,400 h. p. Diesel-electric freight locomotives and two 1,000 h. p. Diesel-electric switching locomotives.

Southern Pacific.—The Interstate Commerce Commission, Division 4, has modified its order of March 25 in Finance Docket No. 13658 so as to permit this road to substitute 12 oil-burning locomotives of the 4-8-8-2 type for some of the steel-sheathed wood-lined box cars originally proposed to be acquired through the $5,660,000 certificate issue. The decision states that War Production Board restrictions will preclude obtaining delivery on all of the box cars. It also reveals that the locomotives, to be built by the Baldwin Locomotive Works, would cost $250,000.57 each or a total of $3,000,006.84; and that WPB "has authorized the necessary priorities for the materials entering into the construction of the locomotives."

Western Fruit Express Company.—Arrangements have been made by the Western Fruit Express Company to borrow $1,500,000 to finance construction of 400 refrigerator cars at estimated cost of $1,695,000. Loan will be payable in 12 semi-annual installments, beginning October 1, 1942, with interest at 2 per cent per annum.

* * *

Elmore Cave, a war worker in the army tank shop at the Baldwin Locomotive Works, Philadelphia, Pa., being congratulated by his fellow workmen for winning first prize of $1,000 in the annual contest by the American Academy in Rome for his sculpture of a riveter and his helper operating a 90-lb. air gun. In 1941 Mr. Cave was runner up in the Academy's contest. His entry then was two boxers

(Turn to next left-hand page)

Supply Trade Notes

Victor W. Ellet, president of the Hunt-Spiller Manufacturing Corporation, Boston, Mass., has become also vice-chairman of the board of directors.

◆

Baldwin Locomotive Works.—*R. Nevin Watt,* sales manager of the Standard Steel

R. Nevin Watt

Works division of the Baldwin Locomotive Works, has been appointed general sales manager, reporting to *William H. Harman,* vice-president in charge of sales. Mr. Watt will have general supervision over all sales of the Locomotive and Ordnance division and the Standard Steel Works division. The products of these divisions include steam, Diesel and electric locomotives, ordnance material, Diesel engines, steel forgings and castings, and rolled steel products. Mr. Watt was born in Philadelphia, Pa., in 1896 and entered the employ of the Standard Steel Works Company, now the Standard Steel Works division, in 1913. He was appointed sales manager in 1930.

Walker H. Evans has been appointed sales manager of the Standard Steel Works division. Mr. Evans was born in Kirk-

Walker H. Evans

wood, Mo., in 1891. After general experience in foundry work he entered the employ of the Baldwin Locomotive Works in 1916. He served in the shops and as erecting engineer in France until 1920 when he was assigned to the Chicago office of Baldwin, where he remained until 1932, when he became Philadelphia district manager for the Standard Steel Works division.

Joseph G. Broz, formerly sales manager for the Baldwin De La Vergne Sales Corporation, has been appointed sales manager of the Diesel division of Baldwin. His broadened activities will include the management of all the company's sales and service both of the Diesel locomotive and the Diesel engine business. Mr. Broz was born in St. Louis, Mo., in 1898. In 1922 he was placed in charge of sales of the Diesel division of the Fulton Iron Works Company of St. Louis, Mo., and in 1932 joined the De La Vergne Engine Company

Joseph G. Broz

as district manager at Kansas City, Mo. He became sales manager of De La Vergne in 1939.

Stewart McNaughton continues as sales manager for steam locomotives; *Clyde G. Pinney* as foreign sales manager; and *Gunther H. Froebel* as sales manager, ordnance and general products.

◆

John Hulst, vice-president of the United States Steel Corporation, retired July 2 upon completion of more than 40 years of association with the corporation and its subsidiary companies.

Obituary

Robert J. Magor, chairman and president of the National Steel Car Corporation, Hamilton, Canada, and chairman of the Magor Car Corporation of New York, died July 4 at Montreal, Canada. He was 60 years of age. After leaving Montreal high school, Mr. Magor took his first job with the Salada Tea Company. In 1906 he joined the Canadian Car & Foundry Co., serving in various capacities until 1910. He then went to New York as assistant manager of the Wonham, Magor Engineering Works, Passaic, N. J., which later became the Magor Car Company, and was elected president of that company five years later. In 1919, Mr. Magor and associates purchased the National Steel Car Corporation. During the period 1927-1930, he served as an assistant to the receiver for the Dominion Iron & Steel Co. of Canada. In 1931-1932 he was economic and financial adviser and relief controller to the Newfoundland government and negotiated the concession of the petroleum monopoly for the island to Imperial Oil, Ltd., which en-

Robert J. Magor

abled the government to meet interest charges on its national debt. In 1935 he aided the government of Alberta, Canada, in an advisory capacity.

◆

Emmett K. Conneely, manager of railroad sales of the Republic Steel Corporation, Cleveland, Ohio, died at the Eye and Ear Hospital, Pittsburgh, Pa., on July 10. Mr. Conneely was born at Bolivar, N. Y., in 1884 and served in various capacities in the employ of the Pittsburgh & Lake Erie during his early business life, joining the Standard Steel Car Company at Baltimore, Md., in 1917. He later became associated with the New York Air Brake Company as vice-president and a director, and in 1925 was appointed New York representative of the Pullman Company. Mr. Conneely subsequently became vice-president of the Standard Steel Car Company at Chicago, in which position he remained until March, 1933. In September, 1933, he became manager of railroad sales, Republic.

◆

D. W. Lloyd, southwestern manager of the Westinghouse Air Brake Company, with headquarters in St. Louis, Mo., died July 4 following a critical operation. After being graduated in mechanical engineering from Pennsylvania State College, Mr. Lloyd entered the employ of the Westinghouse Air Brake Company in October, 1911. He was for some time associated with the company's engineering and commercial activities at Wilmerding, Pa. In 1928 Mr. Lloyd was transferred to the St. Louis office, as district engineer. He became southwestern manager in August, 1941.

◆

Philip D. Block, chairman of the executive committee of the Inland Steel Company, Chicago, died in the Presbyterian hospital in that city on June 30. Mr. Block was born at Cincinnati, Ohio, on February 16, 1871, and, after graduating from high

(Continued on next left-hand page)

school in 1888, joined the Block-Pollak Iron Company, Cincinnati, Ohio, and Chicago, of which his father, Joseph Block, was

Philip D. Block

senior partner. In 1893, he became one of the founders of Inland, which was organized on October 3 and incorporated on October 30, and was elected a director and treasurer. Eight years later he was elected first vice-president and on July 29, 1919, was elected the fifth president of the company. On April 30, 1941, he became chairman of the executive committee.

◆

WILLIAM MORRIS HAGER, who retired in 1940 as vice-president of the American Car and Foundry Co., died on July 1 at Montclair, N. J. Mr. Hager was 74 years old. From 1899 to 1940 he served as an officer and director of the American Car and Foundry Co., having been successively assistant secretary, secretary, assistant to the president, and vice-president. He was also an officer and director of several of the company's subsidiaries.

◆

ROBERT F. RUNGE, vice-president of SKF Industries, Inc., Philadelphia, Pa., died July 6 in Germantown hospital after a prolonged illness. Mr. Runge was 56 years of age. He was a graduate of Drexel Institute in 1906. He then became employed in the engineering department of the Hess-

Robert F. Runge

Bright Manufacturing Company, which later became SKF. He became vice-president of SKF in 1920.

Personal Mention

T. HARRISON has been appointed works manager of the Ogden shops of the Canadian Pacific at Calgary, Alta.

W. N. MESSIMER, general car inspector of the New York Central, has been appointed assistant superintendent of equipment, with headquarters as before at New York.

A. E. CALKINS, superintendent equipment of the New York Central, Buffalo and East, has been appointed assistant to general superintendent of motive power and rolling stock of the system, with headquarters as before at New York.

A. B. COLVILLE, superintendent of motive power of the Great Northern at Spokane, Wash., has been appointed superintendent of motive power, with system jurisdiction, particularly over steam locomotives, with headquarters at Spokane.

A. D. BINGMAN, superintendent of equipment of the New York Central, lines west of Buffalo and the Ohio central lines, with headquarters at Cleveland, Ohio, has been transferred to New York, with jurisdiction over the equipment department, lines Buffalo and east and the Boston & Albany.

J. L. ROBSON, master mechanic of the Great Northern at Grand Forks, N. D., has become superintendent of motive power, with headquarters at St. Paul, Minn., and with system jurisdiction, particularly over Diesel-electric, electric and gas-electric locomotives.

WARREN ROBERT ELSEY, general superintendent of motive power of the eastern region of the Pennsylvania, with headquarters at Philadelphia, Pa., has been appointed assistant to the vice-president in charge of real estate, purchases and insurance. Mr. Elsey was born on April 1, 1892, at Pittsburgh, Pa., and is a graduate of the Carnegie Institute of Technology (1910). He entered railroad service on September 26, 1911, as a draftsman on the Pennsylvania at Pittsburgh. On March 16, 1916, he became piece-work inspector at Shire

Warren Robert Elsey

Oaks, Pa.; on July 16, 1917, shop inspector at South Pittsburgh, Pa.; on April 1, 1920, assistant master mechanic at Canton, Ohio; and on March 1, 1921, motive-power inspector of the Western Pennsylvania division. Mr. Elsey was appointed assistant master mechanic at Conemaugh, Pa., on February 1, 1923, and master mechanic at Baltimore, Md., on February 1, 1928. From January to December, 1929, he was acting superintendent of floating equipment at Jersey City, N. J., and on December 1, 1929, became superintendent of floating equipment there. Mr. Elsey was appointed mechanical engineer at Philadelphia on October 1, 1936, and general superintendent of motive power of the eastern region in January, 1941.

A. L. WRIGHT, assistant to the general superintendent of motive power of the New York Central at New York, has been appointed assistant superintendent of equipment, with headquarters at Cleveland, Ohio.

G. W. BIRK, superintendent locomotive shops of the Cleveland, Cincinnati, Chicago & St. Louis, at Beech Grove, Ind., has been appointed assistant to general superintendent of motive power of the New York Central System, at New York.

HENRY YOERG, general superintendent of motive power and equipment of the Great Northern at St. Paul, Minn., retired on July 1. Mr. Yoerg was born at St. Paul in 1871 and is a graduate of the Massachusetts Institute of Technology. He entered railway service in 1897 as a draftsman of the Great Northern and his first assignment was followed by several years of engineering duties along the system. In 1902 Mr. Yoerg was appointed superintendent of shops in Havre, Mont., and the following year returned to St. Paul as superintendent of the locomotive and car shops. In 1908 he became mechanical engineer and in 1917 assistant superintendent of motive power. Three years later he became superintendent of motive power and in 1935 was appointed general superintendent of motive power and equipment.

RAYMOND C. CROSS, assistant superintendent of equipment of the New York Central at Cleveland, Ohio, has been appointed superintendent of equipment, with headquarters at Cleveland. Mr. Cross was born in Cleveland, Ohio, on November 7, 1886, and entered the service of the New York Central as a machinist apprentice at the Collinwood (Ohio) locomotive shop on July 1, 1901. In June, 1911, he was promoted to gang foreman at the Collinwood enginehouse and in November, 1911, he resigned to go with the Chicago, Great West-

ern as an enginehouse foreman. Four years later he returned to the New York Central and served at various points as terminal foreman until April, 1930, when he became assistant master mechanic. He was appointed master mechanic at Collinwood in

Raymond C. Cross

March, 1934, and on April 1, 1939, assistant superintendent of equipment at Cleveland.

GEORGE S. WEST, general superintendent of the central Pennsylvania general division of the Pennsylvania, with headquarters at Williamsport, Pa., has been appointed general superintendent of motive power of the eastern region at Philadelphia, Pa. Mr. West was born at Altoona, Pa., on June 23, 1893, and is a graduate of Pennsylvania State College, where he received the degree of Bachelor of Science in railroad mechanical engineering in 1917. He entered the service of the Pennsylvania on June 14, 1909, as a laborer at the Olean (N. Y.) shops, working during the summer months while attending school as machinist helper, blacksmith helper, car repairman, draftsman and machinist. After graduation he became a special apprentice, Altoona

George S. West

shops, being furloughed for military service with the 19th Railway Engineers from July, 1917, to October, 1919. On November 1, 1920, he was appointed assistant road foreman of engines at Philadelphia and on February 15, 1923, became assistant master mechanic at New York. On November 1, 1923, he was appointed assistant engineer of motive power of the Central Pennsylvania division; on January 16, 1924, general foreman of the Cumberland Valley division; on June 11, 1924, assistant master mechanic of the New York division, and on June 1, 1928, master mechanic, which position he held successively on the Conemaugh, Buffalo and Philadelphia Terminal divisions. On January 1, 1931, Mr. West became superintendent motive power of the southwestern general division and on November 1, 1931, superintendent of the Monongahela division, being transferred to the Erie and Ashtabula division on September 16, 1932; to the Maryland division on July 1, 1933, and to the Pittsburgh division on April 1, 1935. He was appointed general superintendent of the southwestern division on February 1, 1937, being transferred to the Central Pennsylvania division on May 1, 1939.

IRA G. POOL, master mechanic of the Great Northern at Spokane, Wash., has been promoted to general superintendent of motive power and equipment, with headquarters at St. Paul, Minn. Mr. Pool was born in Minneapolis, Minn., in 1891, and entered the service of the Great Northern in 1920 as a locomotive designer. In 1925 he became a fuel supervisor for the Mesabi district. A year later he was transferred to Great Falls, Mont., as fuel supervisor

Ira G. Pool

for the Montana district, and in 1929 became assistant master mechanic of the Montana division, with headquarters in Havre, Mont. Later in the same year he was transferred to Whitefish, Mont., and in 1931 went to Klamath Falls, Ore., as master mechanic of the Klamath division. After subsequent assignments, he was transferred to Grand Forks, N. D., as master mechanic of the Dakota Division, and in 1941 was transferred to Spokane.

Master Mechanics and Road Foremen

C. R. JOHNSON, division engineer of the Central of Georgia at Macon, Ga., has been appointed road foreman of engines with the same headquarters.

D. L. RINGLER, has been appointed master mechanic of the eastern division of the Texas & Pacific, with headquarters at Marshall, Tex.

G. H. NOWELL, master mechanic of the Canadian Pacific, British Columbia district, at Vancouver, B. C., who has been transferred to the Saskatchewan district, with headquarters at Moose Jaw, Sask., as noted in the July issue, was born on November 13, 1885, at Montreal, Que. He entered the service of the Canadian Pacific on July 2, 1899, as a machinist apprentice at Montreal, and completed his apprenticeship on July 2, 1904. On January 15, 1913, Mr. Nowell was promoted to the position of erecting shop foreman at Ogden, Alta. He became locomotive foreman, with head-

G. H. Nowell

quarters at Cranbrook, on September 4, 1915; division master mechanic on December 5, 1915, with headquarters at Nelson, B. C., also at Revelstoke, B. C., Lethbridge, Alta., and Regina, Sask. He was appointed district master mechanic at Moose Jaw, Sask., on July 1, 1936, and district master mechanic at Vancouver, on October 16, 1937.

Car Department

H. L. HEWING, general car foreman of the Chicago, Milwaukee, St. Paul & Pacific at Chicago, has become general car department supervisor, Northern district, with headquarters at Minneapolis, Minn. Mr. Hewing's name was incorrectly spelled in the July issue.

R. L. CHANDLER, division general car foreman of the New York Central at Buffalo, N. Y., retired on June 30 after 47 years of service.

Shop and Enginehouse

ROBERT L. MORRIS, electrical-mechanical foreman of the Louisville & Nashville at Radnor, Tenn., has been appointed night foreman of the Diesel road locomotive shop at South Louisville, Ky.

SAMUEL CORNELL SNOW, machinist, of the Louisville & Nashville at South Louisville, Ky., has been appointed foreman of the Diesel road locomotive shop at South Louisville.

T. J. LYON, assistant general foreman of the New York Central at West Albany, N. Y., has become superintendent, locomotive shops of the Cleveland, Cincinnati, Chicago & St. Louis at Beech Grove, Ind.

(Turn to second left-hand page)


Time
GREAT NORTHERN
540
Rio Grande
SOUTHERN
6100
ELECTRO-MO
GENERAL MOTORS CORPORATION

Purchasing and Stores

J. E. THRAFF, district storekeeper on the Great Northern at Great Falls, Mont., has been promoted to the position of assistant general storekeeper, a newly created position, with headquarters at St. Paul, Minn.

FRANKLIN J. STEINBERGER, assistant general storekeeper of the Atchison, Topeka & Santa Fe at Topeka, Kans., has been appointed assistant to the general purchasing agent at Chicago.

G. M. BETTERTON, purchasing agent of the Southern Pacific, Pacific lines, with headquarters at San Fracisco, Calif., has been appointed to general purchasing agent, with the same headquarters, a change of title.

J. E. MCMAHON, assistant purchasing agent and general storekeeper of the Chicago, St. Paul, Minneapolis & Omaha, with headquarters at St. Paul Minn., has had his title changed to that of purchasing and stores agent.

A. W. HIX has been appointed general purchasing agent of the Chesapeake & Ohio, the New York, Chicago & St. Louis, and the Pere Marquette. Mr. Hix was born at Bramwell, W. Va., in 1893 and entered railway service on November 24, 1908, as stenographer to the storekeeper on the C. & O., at Richmond, Va., In February, 1910, he was appointed stenographer to the assistant chief clerk and, after serving in various clerical positions, was promoted to assistant to the director of purchases and stores at Richmond in April, 1922. Mr. Hix was transferred to Cleveland in August, 1929, to serve both the C. & O. and the Pere Marquette in the same capacity and in 1931 was promoted to office manager for the assistant vice-president of the C. & O. and the Pere Marquette. Two years later he was appointed office manager for the vice-president of the C. & O. and in July, 1936, he was advanced to assistant to the chief purchasing and stores officer of the C. & O., the Nickel Plate and the Pere Marquette, which position he held until June 1, 1941, when he was promoted to assistant purchasing agent. In February, 1942, he was made acting general purchasing agent.

A. W. Hix

J. S. FAIR, JR., has been appointed to purchasing agent of the Pennsylvania, with headquarters at Philadelphia, Pa. Mr. Fair was born at Ft. Leavenworth, Kan., on December 22, 1905. He is a graduate of Cornell University (1928), with the degree of mechanical engineer. He entered the service of the Pennsylvania as a special apprentice on June 11, 1924, becoming motive-power inspector on October 3, 1930. After serving in several capacities at the Altoona works he went to Harrisburg, Pa., as gang foreman in the enginehouse on July 1, 1934, transferring to Philadelphia on February 7, 1935. The following month he was assigned to special duty in the purchasing department, later returning to the Philadelphia enginehouse. On October 1, 1936, Mr. Fair became office manager in the purchasing department and on July 16, 1938, he was appointed assistant to purchasing agent. On May 15, 1941, he became assistant purchasing agent; on February 1, 1942, assistant stores manager, and on February 16, 1942, acting purchasing agent.

J. S. Fair, Jr.

WILLIAM J. STURGES, purchasing agent of the Canadian National western region with headquarters at Winnipeg, Man., has retired from active service.

R. M. NELSON, general purchasing agent of the Chesapeake & Ohio, the New York, Chicago & St. Louis and the Pere Marquette, has retired at his own request.

WILLIAM S. RIACH, assistant general purchasing agent of the Atchison, Topeka & Santa Fe at Chicago, has been appointed acting general purchasing agent with the same headquarters for the duration.

Obituary

WILLIAM REED DAVIS, master mechanic of the Philadelphia division of the Pennsylvania, with headquarters at Harrisburg, Pa., died of a heart attack at the Enola yards on June 24, at the age of 49.

WILLIAM L. BEAN, former mechanical manager of the New York, New Haven & Hartford, died of a heart ailment at Santa Monica, Calif., on June 26. Mr. Bean was born on January 3, 1878, and graduated in mechanical engineering from the University of Minnesota in 1902. He immediately entered the service of the Northern Pacific as a special apprentice, and on January 1, 1905, became a gang foreman for the Atchison, Topeka & Santa Fe. The following year he was promoted to inspector and in 1908 to machine shop foreman. In 1909, he became division foreman, and a few months later, motive power assistant. In 1911, he was appointed bonus supervisor. Early in 1912 he entered the service of the Oxweld Railroad Service Company as chief engineer, remaining with that company until 1916. Mr. Bean entered the employ of the New Haven in July, 1916. In September, 1917, was appointed assistant general mechanical superintendent; on November 1, 1918, mechanical assistant to the president, and on December 1, 1923, assistant mechanical manager. In June, 1925, Mr. Bean was appointed mechanical manager, with headquarters at New Haven, Conn., in which position he served until the latter part of 1929. He was for a time the western representative of the Leslie Company and in September, 1933, was appointed mechanical assistant to V. V. Boatner, western regional manager on the staff of the federal co-ordinator of transportation. Mr. Bean was president of the New England Railroad Club, 1925-26.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

SILVER ALLOY BRAZING.—Handy & Harman, 82 Fulton street, New York. An eight-page, illustrated bulletin entitled "Silver Alloy Brazing of Fabricated Copper Piping," a process described as presenting "very few problems" and which "can be successfully accomplished by inexperienced men having as little as a week to ten days intensive training."

◆

LUBRICATION OF CINCINNATI MACHINES.—The Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio. Publication No. M-1084. Lubricating instructions, with diagrams, and specifications for Cincinnati, milling, broaching, grinding and lapping machines. Instructions based on an eight-hour day.

◆

TIME-SAVER GUIDE FOR DIESEL MAINTENANCE.—Department 7-N-20, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Twenty-page booklet of practical suggestions and time-saving methods for modern Diesel-electric maintenance. Tips on general inspection, hints on preventive maintenance; tells how to reduce wear; lists parts to stock to save repair time; where to get renewal parts, and how to speed repair service. Lists recommended renewal parts prepared after a careful study of most frequently used parts. Problems of Diesel locomotive operation, not encountered in the operation of steam engines, discussed and solutions offered.

Railway Mechanical Engineer

September 1942

FOUNDED IN 1832

Published monthly by Simmons-Boardman Publishing Corporation, 1309 Noble Street, Philadelphia, Pa. Entered as second-class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, $3.00 for one year U. S. and Canada. Single copies 35 cents. Vol. 116, No. 9.

RAILWAY MECHANICAL ENGINEER

Founded in 1832 as the American Rail-Road Journal

With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office.

Volume 116 *No. 9*

SEPTEMBER, 1942

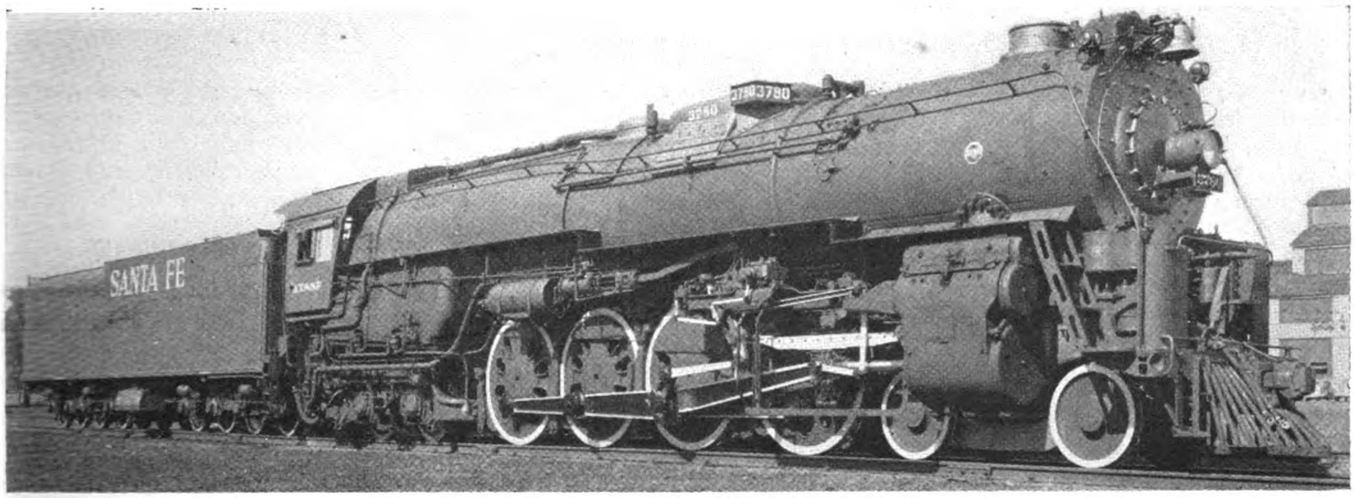
Published on the second day of each month by

Simmons-Boardman Publishing Corporation

1309 Noble street, Philadelphia, Pa. Editorial and Executive Offices: 30 Church street, New York, and 105 West Adams street, Chicago. Branch offices: Terminal Tower, Cleveland; 1081 National Press bldg., Washington, D. C.; 1038 Henry bldg., Seattle, Wash.; 300 Montgomery street, Room 805-806, San Francisco, Calif.; 530 W. Sixth street, Los Angeles, Calif.

Subscriptions (including, when published, the daily editions of the Railway Age, published in connection with the convention of the Association of American Railroads, Mechanical Division), payable in advance and postage free, United States, U. S. possessions and Canada: 1 year, $3; 2 years, $5. Foreign countries, not including daily editions of the Railway Age: 1 year, $4; 2 years, $7. Single copies, 35 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.), and is indexed by the Industrial Arts Index and also by the Engineering Index Service. Printed in U. S. A.



Progressive Changes in

Santa Fe 4-8-4 Locomotives

The locomotives of the last order, delivered late in 1941, are equipped partly with plain-bearing Tandem main rods and partly with Timken roller-bearing rods

DURING the latter half of 1941 the Atchison, Topeka & Santa Fe received ten locomotives of the 4-8-4 type from the Baldwin Locomotive Works. These locomotives are similar in the basic features of the design to the eleven locomotives of the same type which were purchased from this builder in 1938.* The earlier order of locomotives all had boilers with nickel-steel shell plates. The inside firebox sheets of ten locomotives were of carbon steel, while on the eleventh unit they were of nickel steel. In the 1941 order the inside fireboxes of all of the locomotives are nickel steel. The boiler steel was furnished by Lukens.

Two Types of Driving Rods

The features of greatest interest in these locomotives are the driving rods. Eight are equipped with plain-bearing rods with tanden main rods; two are fitted with Timken roller-bearing side and main rods. Lightweight rolled-steel pistons and piston rods and crossheads of the multi-bearing type aluminum alloy gibs are installed on all ten locomotives.

On the eight locomotives with the plain-bearing rods the Tandem main-rod drives on the crank pins of the second and third pairs of driving wheels. Side rods connect the main and front drivers and the intermediate and rear drivers, respectively. The main-rod fit on the crank pin is 8¾ in. in diameter. The two sections of the Tandem main rod are assembled on a steel sleeve the inside diameter of which is 10²⁵⁄₃₂ in. This sleeve is pressed into the two forks of the driving section of the main rod and the bronze-bushed parallel section has 1⁄64 in. clearance on the sleeve.

The two side rods are mounted inside the main rod. Both ends of the rear side rod are fitted with steel bushings with bronze floating bushings between the steel bushings and the crank-pin fits. The front side-rod bearings are similar except that the bearing surfaces between the bronze floating bushing and the steel rod bushing are spherical to accommodate the controlled lateral movement of the front driving wheels.

The rods are of deep I-section with relatively narrow top and bottom flanges. The grease cavities are drilled completely through the heavy section immediately back of the bearings and are countersunk. The cavities are closed by countersunk washers held in place by a through bolt. Grease fittings are applied to the bolt head with a

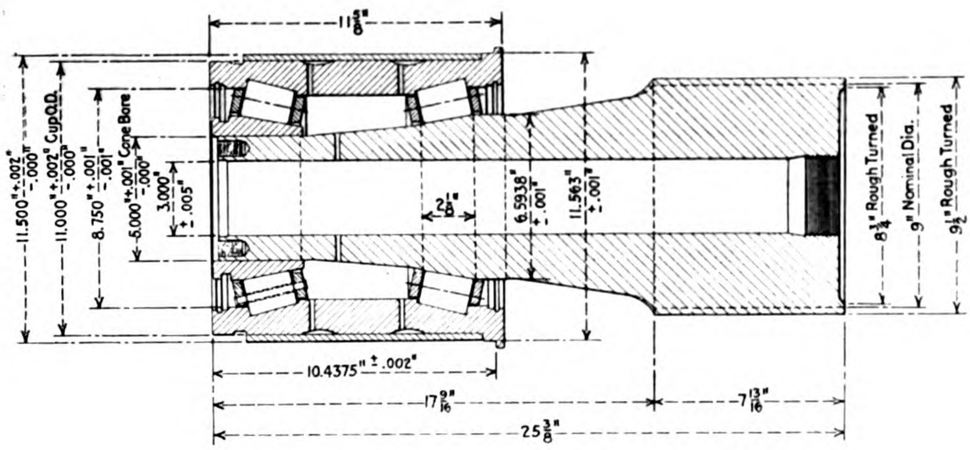
* For a brief description of these locomotives see the *Railway Mechanical Engineer* for February, 1939, page 49.

drilled passage leading into the cavity. Holes are drilled from the cavity to the inside of the rod bore leading into a circumferential groove which distributes the lubricant around the bearing.

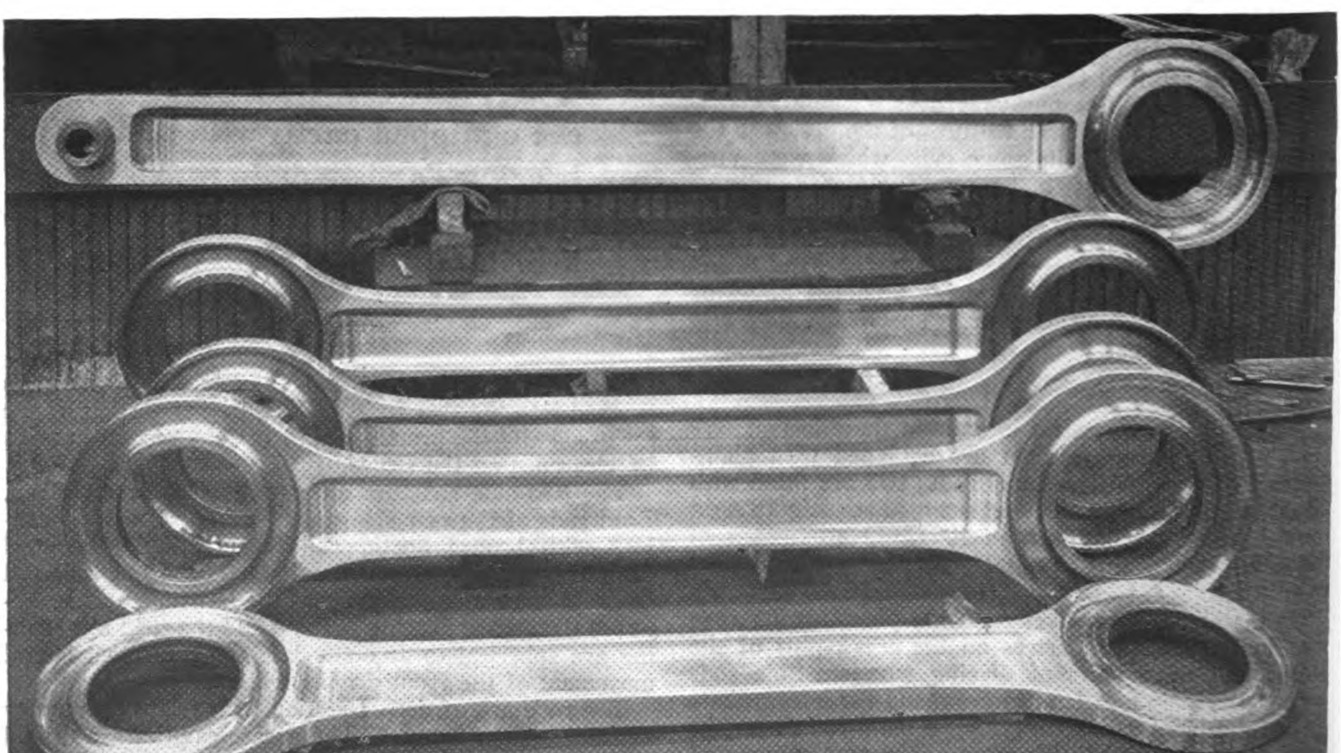
The rods, which are of nickel-chrome-molybdenum steel, quenched and tempered, are of deep, narrow section. The main rod has a depth of 8 in. near the crosshead connection and tapers to 12 in. near the main crank-pin connection. The web is ½ in. thick. The flanges, which are 3½ in. wide by 1 11/16 in. deep at the crosshead end, are 5 in. wide by 15/16 in. deep near the main crank pin. The parallel main rod has a uniform width over the flanges of 3¾ in., tapering down from a depth of 15 in. near the main crank pin to 12 in. near the intermediate crank pin. The web is 7/16 in. thick. The rear side rod tapers from a depth of 8 in. at the outer end to 11 in. at the inner end. The front side rod is a parallel section 12 in. deep by 2¼ in. wide over the flange. The webs of both side rods are 7/16 in. thick.

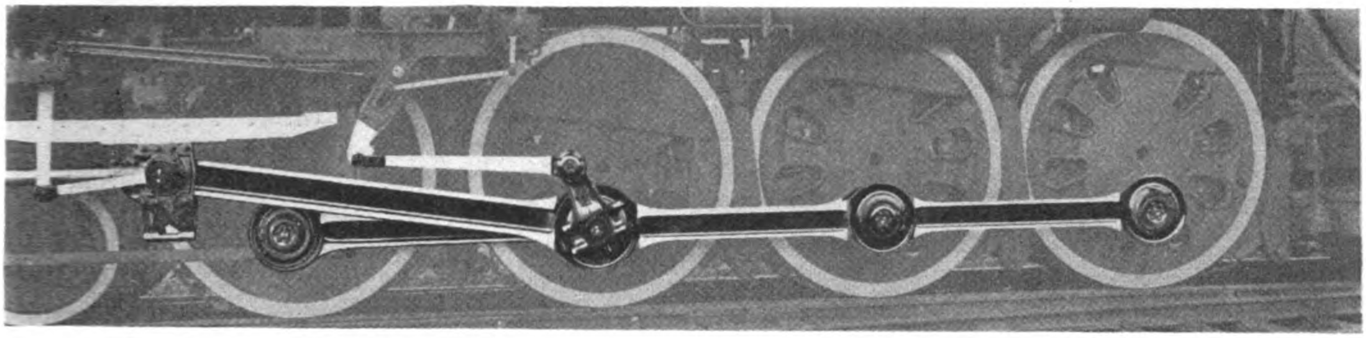
The driving wheels are of the Baldwin disc type. The main and intermediate driving wheels are cross-balanced in accordance with the procedure described in the tentative report of the A. A. R. Mechanical Division special sub-committee on counterbalance dated August, 1939. The front and back driving wheels are not cross-balanced. The overbalance on each driving wheel is 150 lb. The maximum dynamic augment on the intermediate driving wheel, at diametral speed, is 7,680 lb.

Each of the last two locomotives of the order has a complete installation of Timken roller-bearing driving rods. The rod set consists of a main rod, a front side rod, two intermediate side rods between the main and intermediate crank pins, and a rear side rod. One of the drawings shows the arrangement of the main crank-pin assembly. This consists of a triple roller bearing about which turns a sleeve 13 in. in diameter by 16 in. in length. On this sleeve are assembled, first, the rear end of the front side rod; second, the front end of the inside intermediate; third, the rear end of the main, and, fourth, the front end of the outside intermediate rod.

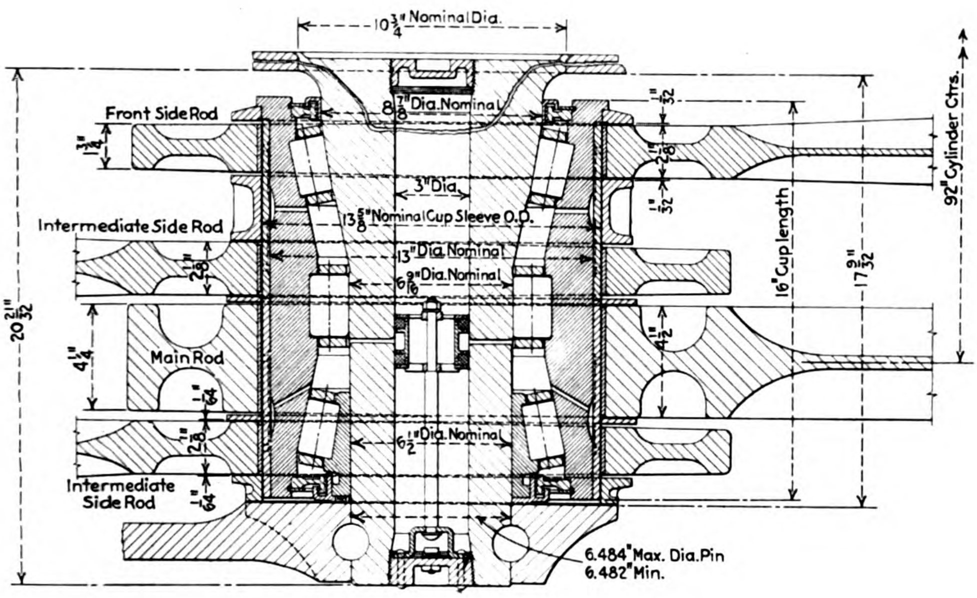


Section through the intermediate crank-pin roller-bearing assembly

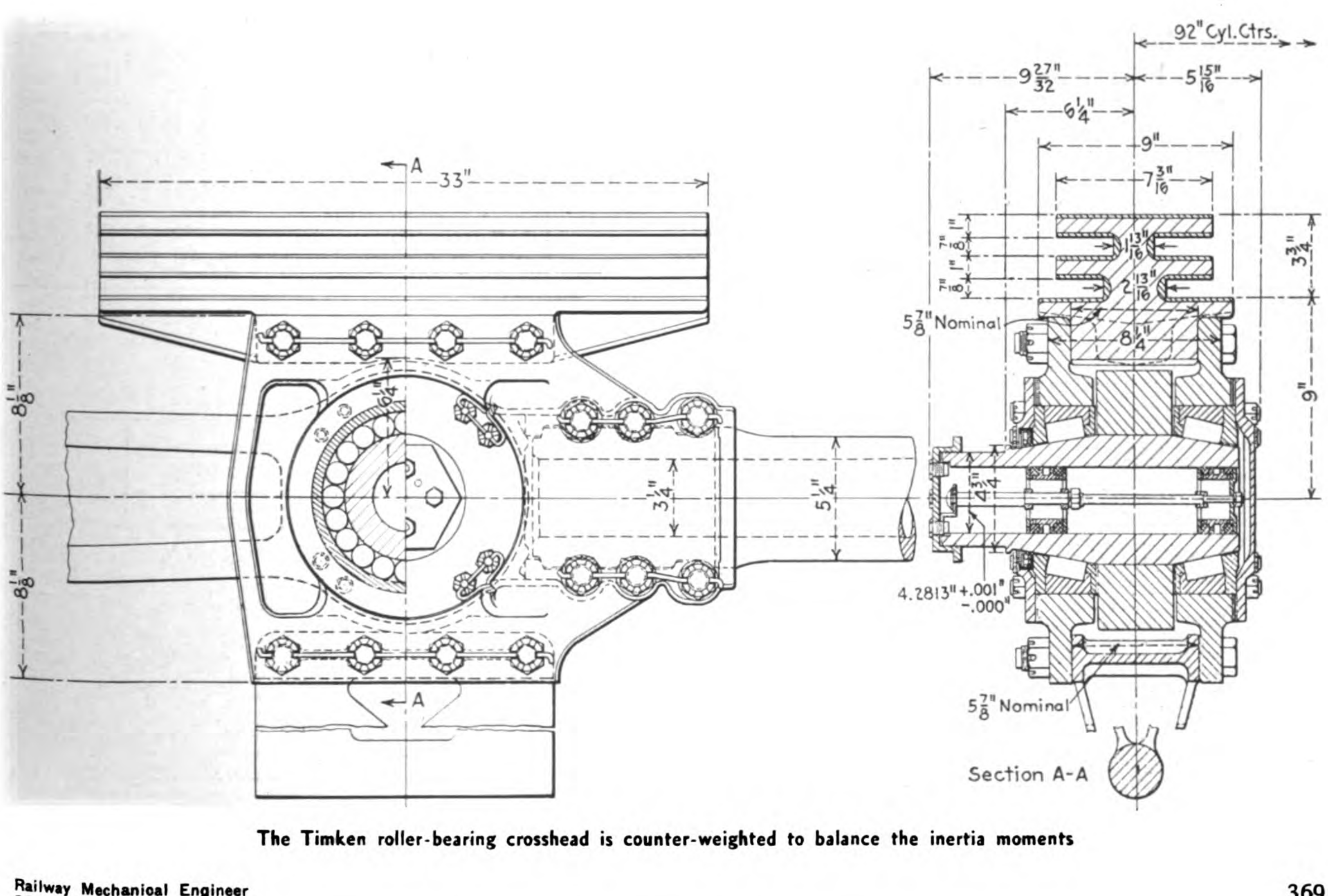

The Timken rods for one side of the 4-8-4 type locomotive



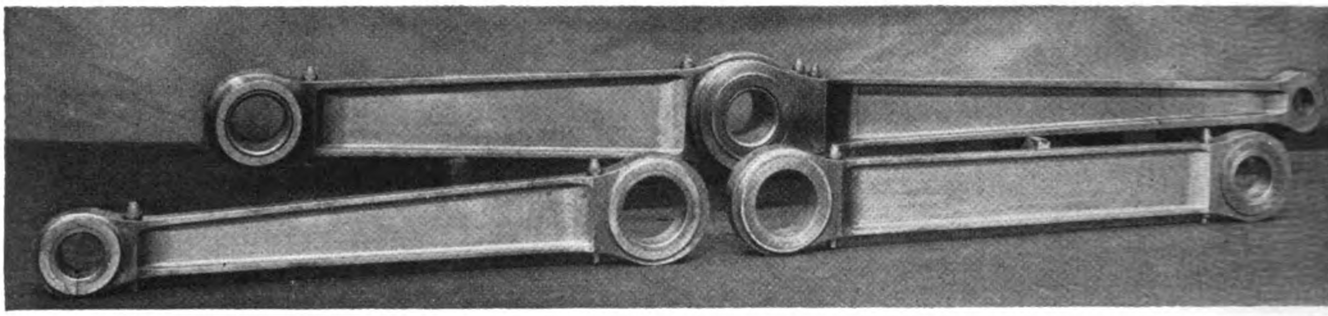
On two of the locomotives there are complete installations of Timken roller-bearing rods



Section through the roller-bearing and rod assembly on the main crank pin



The Timken roller-bearing crosshead is counter-weighted to balance the inertia moments



The Tandem main rod and two side rods for one of the Santa Fe 4-8-4 type locomotives

On the roller-bearing sleeve of the intermediate crank pin are assembled, first, the rear end of the inside intermediate side rod; second, the front end of the rear side rod, and, third, the rear end of the outside intermediate side rod. Thus, the rear side rod is directly in line with the main rod and, except for the front side rod at the inside of the main crank-pin sleeve, the forces applied to the bearing sleeves through the rods are symmetrically distributed.

The methods of lubrication are essentially the same as those described in connection with a previous application of the Timken roller-bearing rods.*

Reciprocating Parts

The reciprocating parts on all ten of the locomotives are of the Timken lightweight design. The piston is of rolled-steel, light Z-section, and is fitted with the Locomotive Finished Material Company's combination universal sectional wearing and packing rings. The piston rod is hollow with 1-in. walls. The crosshead is of the Timken two-piece type, clamped on the tapered multi-shoulder bearings of the piston rod. The multi-bearing crosshead shoe is aluminum with bearing metal faces on the ledges.

One of the features of the crosshead is a counterweight bolted between the two halves of the body opposite the crosshead shoe. This balances the tilting moment

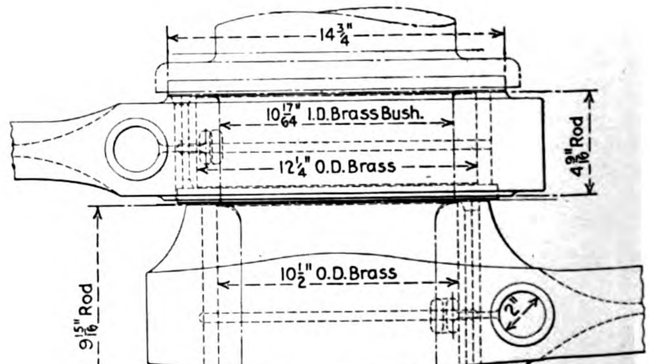
* See the *Railway Mechanical Engineer* for December, 1935, page 493—"Roller Bearing Rods in Passenger Service Over a Year."

General Dimensions, Weights and Proportions of the A. T. & S. F. 4-8-4 Type Passenger Locomotives

	8 Locos.	2 Locos.*
Railroad	A. T. & S. F.	
Builder	Baldwin	
Type of locomotive	4-8-4	
Road class	3765	
Road numbers	3776-3783	3784-3785
Date built	Aug., 1941	
Service	Passenger	
Dimensions:		
Height to top of stack, ft.-in.	16-0	
Height to center of boiler, ft.-in.	10-10½	
Width overall, in.	11-0	
Cylinder centers, in.	92	
Weights in working order, lb.:		
On drivers	281,900	286,140
On front truck	93,320	92,050
On trailing truck	119,410	118,520
Total engine	494,630	496,710
Tender, two-thirds oil and water	375,155	375,155
Wheel bases, ft.-in.:		
Driving	21-3	
Rigid	13-10	
Engine, total	50-0	
Engine and tender, total	108-2	
Wheels, diameter outside tires, in.:		
Driving	80	
Front truck	42	
Trailing truck	50	
Engine:		
Cylinders, number, diameter and stroke, in.	2—28 x 32	
Valve gear, type	Walschaert	
Valves, piston type, size, in.	15	
Maximum travel, in.	7⅝	
Steam lap, in.	2¼	
Exhaust lap, in.	⅛	
Lead, in.	5/16	
Cutoff in full gear, per cent	60	

	8 Locos.	2 Locos.*
Boiler:		
Type	Conical	
Steam pressure, lb. per sq. in.	300	
Diameter, first ring, inside, in.	88¼	
Diameter, largest, outside, in.	102	
Firebox, length, in.	143 31/32	
Firebox, width, in.	108	
Height mud ring to crown sheet, back, in.	78⅝	
Height mud ring to crown sheet, front, in.	93 5/32	
Combustion chamber length, in.	64	
Thermic syphons, number	One	
Tubes, number and diameter, in.	52-2¼	
Flues, number and diameter, in.	220-3½	
Length over tube sheets, ft.-in.	21-0	
Net gas area through tubes and flues, sq .ft.	10.5	
Fuel	Oil	
Grate area, sq. ft.	108	
Heating surfaces, sq. ft.:		
Firebox and comb. chamber	430	
Thermic syphons	29	
Firebox, total	459	
Tubes and flues	4,852	
Evaporative, total	5,311	
Superheater	2,366	
Combined evap. and superheater	7,677	
Tender:		
Type	Water bottom	
Water capacity, gal.	25,000	
Fuel capacity, gal.	7,000	
Trucks	Eight-wheel	
Journals, diameter and length, in.	—	6½-in. roller bearings
Rated tractive force, engine, 70 per cent, lb.	66,000	
Weight proportions:		
Weight on drivers ÷ weight engine, per cent	57.0	57.6
Weight on drivers ÷ tractive force	4.3	4.3
Weight of engine ÷ evaporation	93.1	93.6
Weight of engine ÷ comb. heat. surface	64.4	64.7
Boiler proportions:		
Firebox heating surface, per cent combined heating surface	6.0	
Tube-flue heating surface, per cent combined heating surface	63.2	
Superheater heating surface, per cent combined heating surface	30.8	
Firebox heating surface ÷ grate area	4.3	
Tube-flue heating surface ÷ grate area	44.9	
Superheater heating surface ÷ grate area	21.9	
Combined heating surface ÷ grate area	71.1	
Evaporative heating surface ÷ grate area	49.2	
Tractive force ÷ grate area	611.1	
Tractive force ÷ evaporative heating surface	12.4	
Tractive force ÷ combined heating surface	8.6	
Tractive force × diameter drivers ÷ combined heating surface	687.7	

* With roller-bearing crossheads and rods.



Rear end of the Tandem main rod and front end of the rear side rod on the intermediate crank pin

caused by the inertia of the overhanging crosshead shoe at the top, thus maintaining uniformly distributed wear on the guide bearing surfaces.

The piston, piston rod, and crosshead body are Timken high-dynamic steel, quenched and drawn to develop a yield point of 110,000 lb.

Progressive Changes in Succeeding Orders

Several orders of 4-8-4 type locomotives in basic design similar to those delivered last year have been built for this road since early in 1927. There have been some changes in the boiler dimensions and proportions. In the early orders the boiler diameter was 88 in. and the working pressure 210 lb., with cylinders 30 in. in diameter by 30 in. stroke. The tractive force was 66,000 lb. The design of the boiler was changed in the 1938 order, increasing the diameter to 90 in. and providing for a working pressure of 300 lb. per sq. in. The distribution of the heating surface has been changed slightly in the various orders, but there has been no major change in this respect. With the increase in boiler pressure the cylinders were changed to 28 in. diameter by 32 in. stroke. The tractive force has remained unchanged throughout these changes.

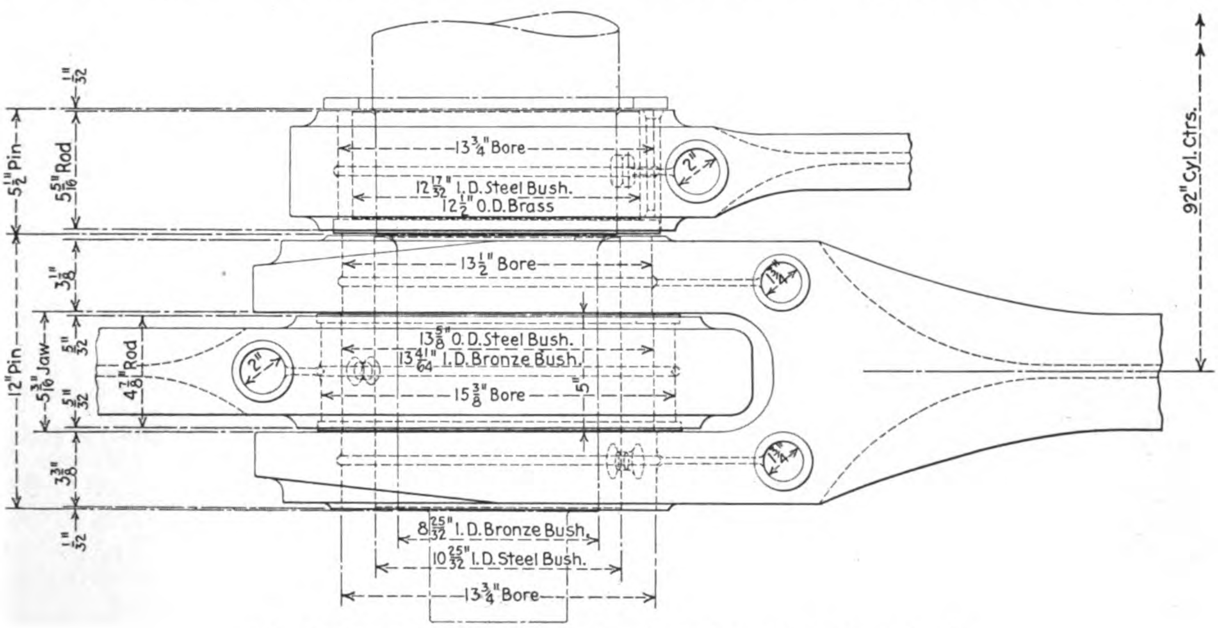
The earlier orders of these locomotives had 73-in. driving wheels, with weights on drivers varying around 270,000 lb. and total engine weights which increased progressively from 422,000 lb. to 433,500 lb. The new locomotives, as well as those built in 1938, have 80-in. driving wheels. In the 1938 order the weight on drivers is 287,000 lb. and the total engine weight just under 500,000 lb. The weight on the driving wheels of the eight locomotives with plain-bearing rods is about 282,000 lb. and the total weight of the engines 494,630 lb. The locomotives with the roller-bearing rods weigh 286,000 lb. on the drivers and 496,710 lb. for the total engine.

Other progressive changes which have been made in the design of these locomotives are in the engine- and trailing-truck wheel diameters. Starting with engine trucks with 33-in. wheels and trailer trucks with 40-in. wheels, the diameters of the engine-truck wheels were stepped up to 37 in. on the 1938 lot and to 42 in. on the 1941 locomotives. On the latter the trailing-truck wheels were also increased from 40 in. in diameter to 50 in. in diameter.

Tender sizes on the Santa Fe 4-8-4 type have also progressed upward. The locomotives of this type ordered up to and including 1929 had a water capacity of 15,000 gals. and a fuel capacity of 20 tons. These tenders were carried on two six-wheel trucks. In the 1938 order the water capacity was increased to 21,000 gals. and the fuel capacity was 7,000 gals. of oil. This tender was also carried on two six-wheel trucks. The water capacity of the tenders for the 1941 locomotives has been further increased to 25,000 gals. The fuel capacity remains at 7,000 gals. These tenders are carried on two eight-wheel trucks.

Other Features of the Latest Design

The locomotives are built up on General Steel Castings one-piece cast-steel locomotive beds, of which the cylinders are an integral part. They have the Batz spring arrangement on the engine trucks. The trailing trucks are the Commonwealth four-wheel Delta type. All journals on the locomotive and tender are fitted with Timken roller bearings; those on the engine-truck and driving axles are inside, with the journal boxes connected in pairs. The driving boxes are the split type and are fitted with Franklin compensators and snubbers. There is no lateral between the driving boxes and driving-wheel hubs. There is a total lateral play in the front wheel pedestals of 1⅛ in. and in the main, intermediate and back of ⅜ in.



The Tandem main-rod and front side-rod assembly on the main crank pin

Alloy steel is extensively used in the running gear of these locomotives. Like the rods of the eight locomotives with plain-bearing rods, the driving axles as well as the axles of the engine and trailing trucks are of quenched and tempered chrome-molybdenum steel. The same material is also used for the main and intermediate crank pins. The front and back crank pins are quenched and tempered carbon steel.

These locomotives are equipped with Worthington feedwater heaters, Type E superheaters with multiple throttles in the headers, Signal Foam Meters, and with one Thermic syphon in each firebox. They are the first order of this type on the Santa Fe which has been fitted with two 8½-in. cross-compound air compressors. The brakes are the Westinghouse No. 8ET.

The general weights, dimensions, and proportions are shown in the table.

Associations to Hold

Conventions in Print

Member meetings of coordinated associations are cancelled because of wartime conditions—Committee reports will be presented in November issue

MEMBER meetings of the four Coordinated Mechanical Associations—the Railway Fuel and Traveling Engineers' Association, the Car Department Officers' Association, the Master Boiler Makers' Association, and the Locomotive Maintenance Officers' Association—will not be held this year because of the pressure of wartime demands on the supervisors of the various railroads who ordinarily participate and find the convention meetings a source of much help and interest. However, the four associations are proceeding with their plans to have prepared for later presentation to their members the committee reports formerly part of the programs of each convention and published as part of the proceedings. It is hoped in this way to make available to all members information of value concerning developments in their respective fields.

It has been customary in the past for the *Railway Mechanical Engineer* to devote the issue following the association meetings to the publication of the various reports presented during the convention sessions. The same practice will be followed this year and the November issue will be a "convention issue." The committee reports which are available in time for publication will be used as though convention sessions had actually been held and the work of the various committees presented directly to the members.

The reports scheduled for preparation by each association are listed below.

Railway Fuel and Traveling Engineers' Association

Air Brakes—Chairman, F. T. McClure, general air brake supervisor, Atchison, Topeka & Santa Fe, Topeka, Kans.
(a) Handling Air Brakes on Diesel Locomotives in Freight Service.
(b) Can Air Brake Tests at Intermediate Terminals Be Eliminated?

Locomotive Firing Practice—Coal—Chairman, W. O. Shove, general road foreman of engines, New York, New Haven & Hartford, West Haven, Conn.

Locomotive Firing Practice—Oil—Chairman, Roy W. Hunt, fuel supervisor, Atchison, Topeka & Santa Fe, Los Angeles, Calif.

Gas Turbine Powered Locomotives—Chairman, L. P. Michael, chief mechanical engineer, Chicago & North Western, Chicago.

Fuel Records and Statistics—Chairman, E. E. Ramey, fuel engineer, Baltimore & Ohio, Baltimore, Md.

Front Ends, Grates, Arches and Ash Pans—Chairman, J. R. Jackson, engineer of tests, Missouri Pacific, St. Louis, Mo.

The Road Foreman and the Diesel Locomotive—Chairman, W. D. Quarles, general mechanical instructor, Atlantic Coast Line, Rocky Mount, N. C.

Coal—Various Sizes in Relation to Fuel Economy—Chairman, S. A. Dickson, supervisor fuel economy, Alton, Bloomington, Ill.

Utilization of Motive Power—Chairman, A. A. Raymond, superintendent fuel and locomotive performance, New York Central, Buffalo, N. Y.

Car Department Officers' Association

Selection and Training of Supervision—Chairman, J. E. Keegan, chief car inspector, Pennsylvania, Chicago.

Repair Methods and Shop Kinks—Chairman, R. K. Betts, foreman car repairs, Pennsylvania, Chicago.

Roller Bearing Inspection and Maintenance. Draft and Buffer Gear Maintenance—Chairman, C. P. Nelson, general passenger car foreman, Chicago & North Western, Chicago; Vice-Chairman, K. H. Carpenter, superintendent car department, Delaware, Lackawanna & Western, Scranton, Pa.

Packing and Servicing Journal Boxes—Chairman, J. R. Brooks, supervisor lubrication and supplies, C. & O., Richmond, Va.

Minimum Detention of Bad Order Cars—Chairman, H. E. Wagner, division general car foreman, Missouri Pacific, Dupo, Ill.

Interchange and Billing for Car Repairs—Chairman, E. G. Bishop, general foreman car department, Illinois Central, E. St. Louis, Ill.

A. A. R. Loading Rules—Chairman, E. N. Myers, chief interchange inspector, Twin City Joint Car Inspection Association, St. Paul, Minn.

Passenger Car Terminal Painting; Freight Car Painting—Chairman, Harry Stahnke, general painter foreman, New York Central, Albany, N. Y.

Master Boiler Makers' Association

Topic No. 1—General Prevention of Cinder Cutting of Locomotive Boilers.

Topic No. 2—Application and Maintenance of Flues and Arch Tubes, Without Copper Ferrules.

(a) How Does Mileage and Service Compare to Those Applied with Copper Ferrules?

(b) Should Flues and Tubes Be Welded to the Firebox Sheet at Time of Application?

Topic No. 3—Treating Boiler Feedwater Chemically.

(a) What Is the Best Approved Method of Blowing Down Boilers? (1)—At terminals. (2)—By the engine crews on the road?

Topic No. 4—What Defects Have Developed in High-pressure Boilers and What Methods Are Used to Repair Them?

Topic No. 5—Recommendations Concerning the Latest Methods That Are Being Used in the Fabrication of Boilers of Iron, Steel and Alloy Materials.

Topic No. 6—Substitution in Material and Practices in Boiler and Tender Fabrication and Maintenance for the Conservation of Both Material and Labor.

Locomotive Maintenance Officers' Association

Committee of Air Brake Equipment Maintenance—Wartime Maintenance of Air Brake Equipment—Chairman, J. P. Stewart, general superintendent air brakes, Missouri Pacific, St. Louis, Mo.

Committee on Improved Locomotive Maintenance Practices—Facilities and Practices Used in Diesel Locomotive Repairs.

Committee on Lubrication—Chairman, J. R. Brooks, supervisor lubrication and supplies, Chesapeake & Ohio, Richmond, Va.

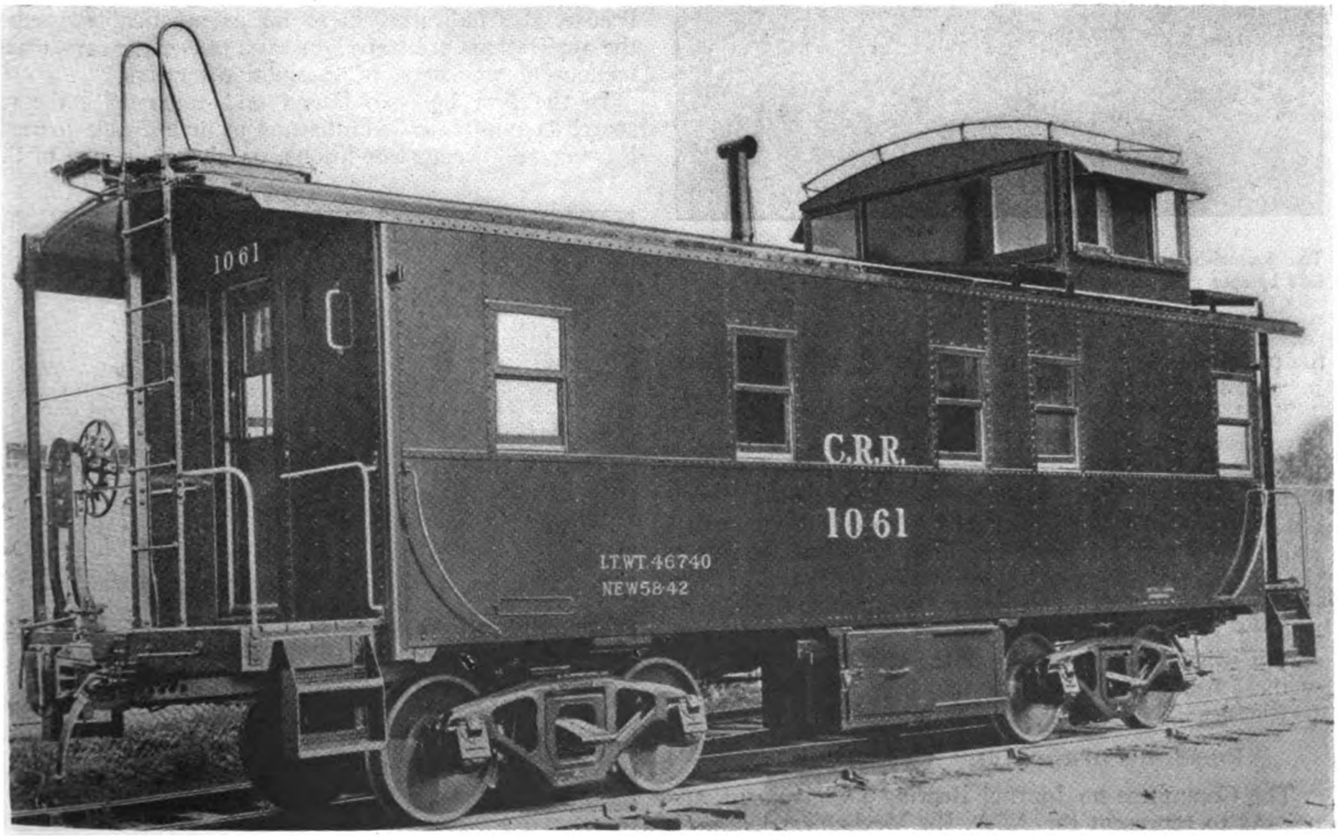
Committee on Personnel—Selection, Procurement and Training of Supervisory Personnel—Chairman, F. K. Mitchell, assistant general superintendent of motive power and rolling stock, New York Central, New York.

Committee on Safety.

Committee on Shop Tools—Wartime Substitutions for Critical Tool Steel in Railroad Machining Work—Chairman, E. A. Greame, tool room foreman, Delaware, Lackawanna & Western, Scranton, Pa.

Committee on Welding—Report to A. A. R. by H. E. Gannett, general welding supervisor, Chicago, Burlington & Quincy, Chicago, Ill.

* * *



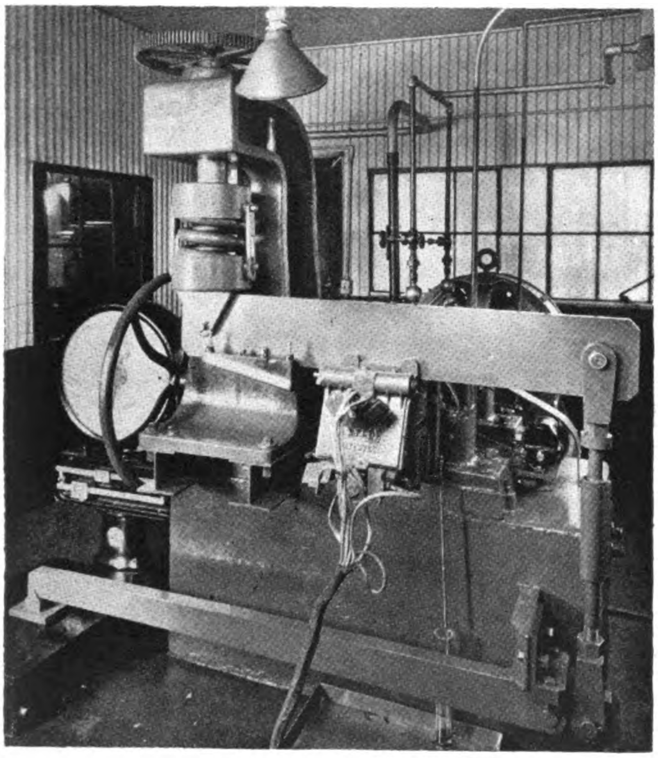
Caboose built by the American Car and Foundry Company for the Clinchfield

Changes in Journal Bearings to

Conserve Strategic Metals

Progress report of A. A. R. research program develops the advantages of machine broached linings and of bearings with depressed backs—Ferrous-back bearings still under study

EARLY in January of this year, the Association of American Railroads, Mechanical Division, began a comprehensive study of the possibility of reducing strategic metals used in car journal bearings. This research is being conducted in the laboratory of the Railway Service & Supply Corp., Indianapolis, Ind., and has three primary objectives, namely, to secure increased service from present bearings, to minimize the amount of strategic metals required in journal bearings, and to investigate the possibility of replacing copper-bearing alloys by some form of ferrous back.



The journal-bearing test machine showing method of applying the load by spur gear and shaft connection from a large handwheel in the rear

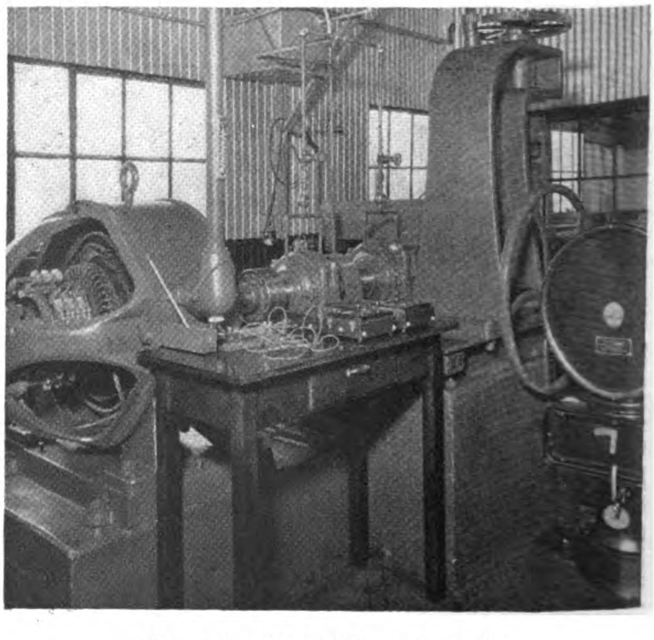
To date, three primary bulletins or progress reports have been issued, the first of which relates to an important detail of wedge construction. The second recommends broached linings for all bearings and suggests an A. A. R. modified, "depressed back" design for all orders of new journal bearings. The third bulletin shows the advantages of reduced lining thickness and recommends further slight changes in the modified journal-bearing design which will facilitate manufacture and save a still larger percentage of the strategic metals used in these bearings. The performance of various types of ferrous-back bearings is still being studied.

Personnel of the Research Committee

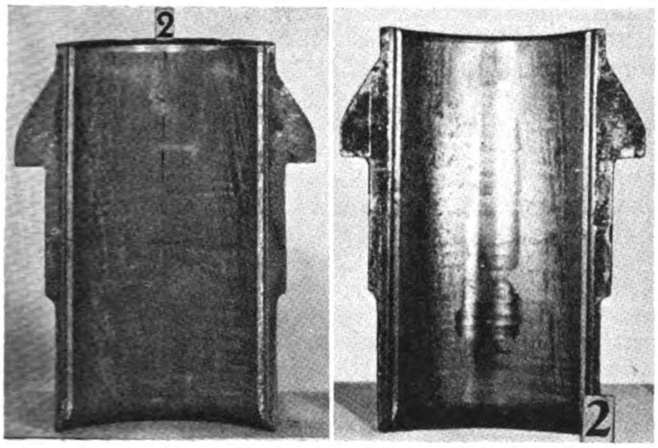
The Committee on Journal Bearing Development, appointed to represent the A. A. R., Mechanical Division, in this special research, includes Chairman W. I. Cantley, mechanical engineer, A. A. R. Mechanical Division; J. R. Jackson, engineer of tests, Missouri Pacific; L. B. Jones, engineer of tests, Pennsylvania; C. B. Bryant, engineer of tests, Southern; J. W. Hergenhan, assistant engineer, test department, New York Central; and J. Mattise, general air brake instructor, C. & N. W.

Tests are conducted under the direction of the A. A. R. research committee in the laboratory of the Railway Service & Supply Corp. E. S. Pearce, president of this company and owner of a patent on the modified light-weight journal bearing design, has arranged to grant railroads, carbuilders and bearing manufacturers non-exclusive licenses to make and use the modified journal bearing on railway equipment during the present national emergency, in consideration of nominal payments of one dollar a year. Another requirement is the furnishing of monthly reports to show the number of bearings manufactured or used and sold under this license, also indicating in so far as practicable whether the applications are to freight cars, passenger cars, maintenance of way cars, or locomotive tenders.

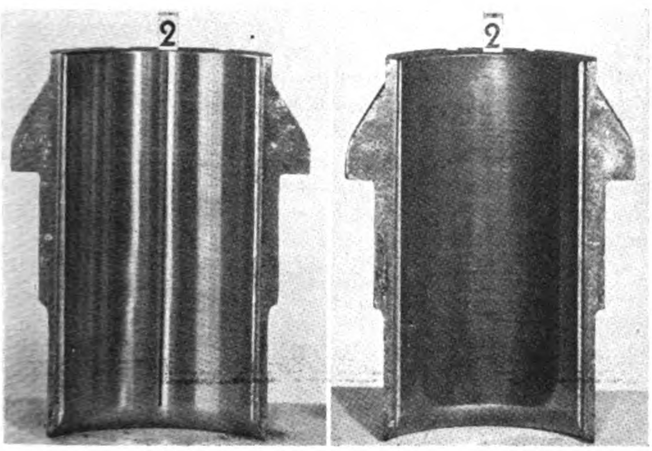
In the first bulletin, issued on January 19, the research committee called attention to undesirable journal-bearing and wedge conditions, as shown in one of the



The motor drive of the test machine



A. A. R. modified journal bearing with as-cast lining—Left: Fair surface and partial crown contact before test—Right: Irregular contact area of 10.30 sq. in. after test



Same A. A. R. modified bearing with machine-broached lining—Left: Accurate full-line crown contact before test—Right: Two-point loading and 8.73 sq. in. of bearing area test

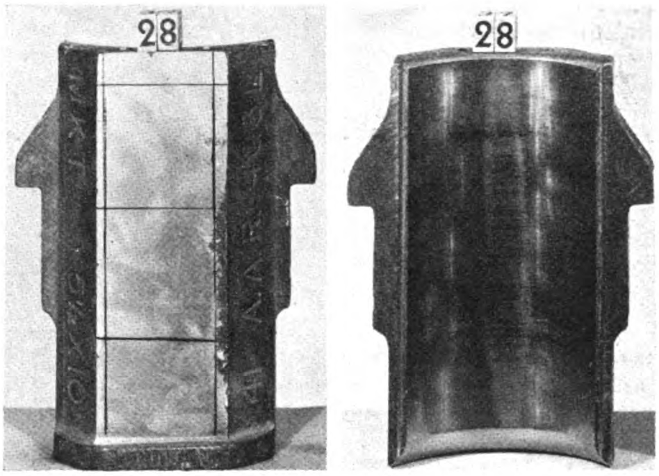
illustrations, which tend to cause collar breakage and attendant waste of journal bearing metal. With a wedge of standard length and having straight, square ends, an accurate fit is secured on the journal-bearing collar with attendant development of shear stress only which the collar is designed to resist safely. With a taper-end wedge, or one having a ridge which brings the contact point at the top of the journal-bearing collar, the collar is subject to bending stress which is excessive in amount and tends to crack or break off the collar. The Mechanical Division, general committee, approved the recommendation of the research committee that corrective measures be taken to assure a proper fit at this important bearing surface between the wedge end and the journal-bearing collar on all equipment now in service.

Advantages of Broached and Depressed-Back Bearings

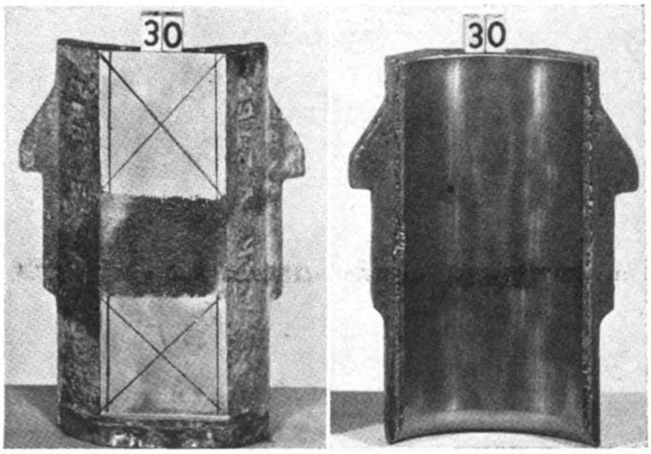
In determining the economic and operating value of properly machine-broached journal bearings, as compared with as-cast linings, and to determine the merit of A. A. R. modified depressed-back bearings, as compared with former standard A. A. R. plain-back bearings, Series A tests were conducted, embracing 60 runs. Journal bearings used during the tests were supplied by the National Bearing Metals Corporation, St. Louis, Mo., the Magnus Metal Corporation, Chicago, and by the Pennsylvania. All of these bearings were babbitt lined except six, supplied by Magnus, which were lined with Satco metal. The operating test schedule called for a continuous run for 170 min. under 16,375 lb. total load, including 30 min. at 30 m. p. h., 20 min. at 20 m. p. h. and 120 min. at 50 m. p. h. In all test runs of this series, 8 lb. of packing and 3.25 lb. of renovated car oil were used for each pound of new-cotton waste.

The test machine consisted of a standard 5½-in. by 10-in. axle journal, supported by two calibrated roller bearings and connected by a flexible coupling to a 100-amp. 230-volt d. c. calibrated motor, capable of driving the journal at any constant speed from 0 to 100 m. p. h. The load, applied by a large handwheel through reduction spur gears and a spring-supported connection to the end of the lever arm, was measured and kept constant at the desired point through the use of a Fairbanks scale.

As a result of this series of tests, the Committee on Journal Bearing Development reported substantially the same laboratory performance at various speeds under full rated rail load for both the modified and the standard journal bearings. They found that journal bearings having linings properly machine broached, other things remaining the same, give outstandingly better performance than the same bearings having as-cast unbroached linings. This is borne out by the much smoother power curve for broached bearings, shown in one of the charts. The committee also found that journal bearings with depressed backs under the same conditions give im-



A. A. R. journal bearing with plain back—Left: Back machined flat—Right: Typical center loading with 8.08 sq. in. of bearing area after test



A. A. R. modified journal bearing with depressed back—Left: Two pads machined flat—Right: Typical two-point loading with 7.87 sq. in. of bearing area after test

proved overall performance in relation to the journal and the wedge, as compared with the same bearings having plain non-depressed backs. The definitely higher operating temperatures of plain-back bearing at various speeds are shown in a second chart.

Based on the salient facts established through the Series A tests, the committee made two specific recommendations, designed to conserve strategic metals by further direct reductions in weight per bearing and at the same time affect an indirect conservation by reducing operating delays from overheating due to newly-applied bearings: (1) That the practice of applying car journal bearings with as-cast linings be discontinued and all new railway car journal bearings have linings machine-broached to a proper bearing surface with the minimum thickness allowable under modified design, then known as the D-23 1-15-42; (2) that the depressed-back detail, shown as an alternate design of the modified bearing, shall be specified on orders for all new bearings purchased to the modified design during the present emergency.

Reduced Thickness of Bearing Back and Lining

In the third bulletin, issued May 15, 1942, the Committee on Journal Bearing Development recommended and the General committee approved another emergency bearing D-23 5-29-42 with reduced weight over the previous modified bearing by decreasing the thickness of the back and the lining wall within the limits established as possible through the laboratory tests and practical to manufacture with the present machine tool and fixture equipment available for making railway car journal bearings. No changes in the pattern for the modified bearing design earlier proposed were necessary.

The object of the investigation reported in the third bulletin was to explore the possibilities of a further curtailment of strategic material by decreasing the thickness of the back and the lining. A total of 32 Series B test runs were made with three different size bearings, namely, (a) bearings tested on a nominal 5½-in. diameter journal; (b) bearings tested on the same journal turned down to 5 in. in diameter; and (c) special tests of a shortened bearing on the 5½-in. nominal diameter journal.

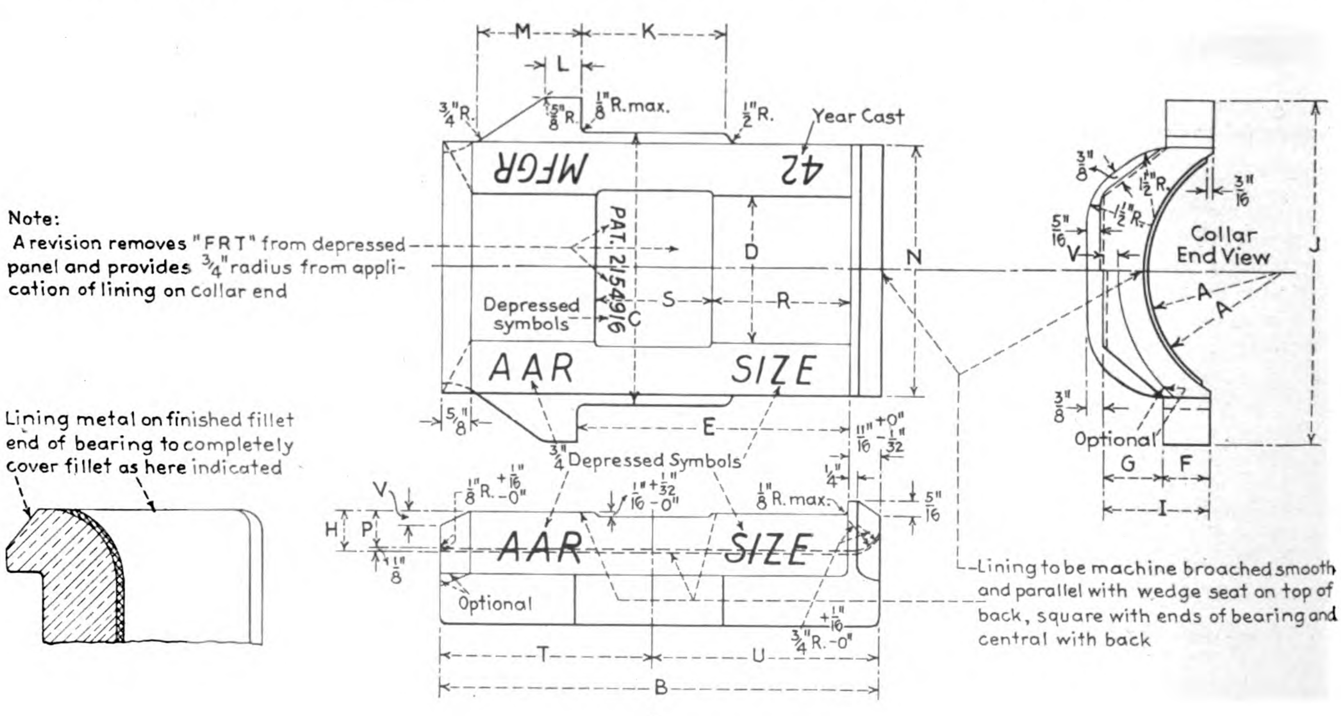
All test bearings were 5½ in. by 10 in., with A. A. R. bronze backs and babbitt linings, made by the National Bearing Metals Corporation. The shortened bearing was reduced ¾ in. in length at the lug end and used for the purpose of a special test.

The Series B test procedure called for a continuous run for eight hours under 16,375 lb. total load at 40 m. p. h. and a similar run at 80 m. p. h., or 16 hours total run with an over-night cooling-down period between each 8-hr. test. The same proportions of packing, renovated car oil and new dry-cotton waste were used in the Series B as in the Series A tests.

The test machine was the same as that previously described. The temperatures of the journal and the bearing were measured at 90-sec. intervals and recorded on temperature charts. Changes in position of the bearing in the horizontal plane and of the assembly (bearing plus axle) in the vertical plane, due to load and heat generated, were measured by means of special deflection gages.

Conclusions Reached

As the result of the Series B tests, the general conclusions were drawn regarding both A. A. R. standard



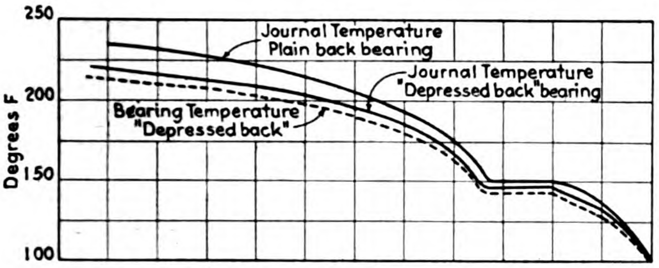
Dimensions in Inches

Class	Size of Journal, in.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	R	S	T	U	V
A	3¾ x 7	1 29/32	6½	4¼	2	4 3/16	7/8	1⅛	13/16	2	5½	2¾	½	1⅝	3¾	11/16	1 11/16	2	3⅛	3⅜	¼
B	4¼ x 8	2 5/32	7½	4⅝	2 5/16	4 11/16	27/32	1 9/32	13/16	2⅛	5⅞	2¾	⅝	1¾	4⅜	11/16	2 1/16	2¼	3⅝	3⅞	¼
C	5 x 9	2 17/32	8½	5⅜	3⅛	5⅜	1 1/32	1 7/32	15/16	2¼	6⅞	3⅛	11/16	2 1/16	4⅞	13/16	2 7/16	2½	4⅛	4⅜	5/16
D	5½ x 10	2 25/32	9½	5⅞	3⅛	5⅞	1 1/16	1 5/16	15/16	2⅜	7⅜	3⅛	¾	2¼	5⅜	13/16	2 15/16	2½	4⅝	4⅞	5/16
E	6 x 11	3 1/32	10½	6⅞	3½	6 13/16	1¼	1½	1 1/16	2¾	8⅜	4	13/16	2 7/16	6¼	15/16	3 5/16	2¾	5⅛	5⅜	⅜
F	6½ x 12	3 9/32	11½	7⅜	4	7 5/16	1 7/16	1 9/16	1 3/16	3	8⅞	4	⅞	2⅝	6½	1 1/16	3½	3⅜	5⅝	5⅞	⅜

Permissible Variations

		A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	R	S	T	U	V
Plus		1/32	1/32	1/32	1/32	1/16	1/32	3/64	1/32	...	...	...	...	...	...	1/32	...	...	...	...	...
Minus		3/64	1/32	1/32	1/32	1/32	3/64	0	1/32	...	...	...	...	...	...	1/32	...	...	...	...	...

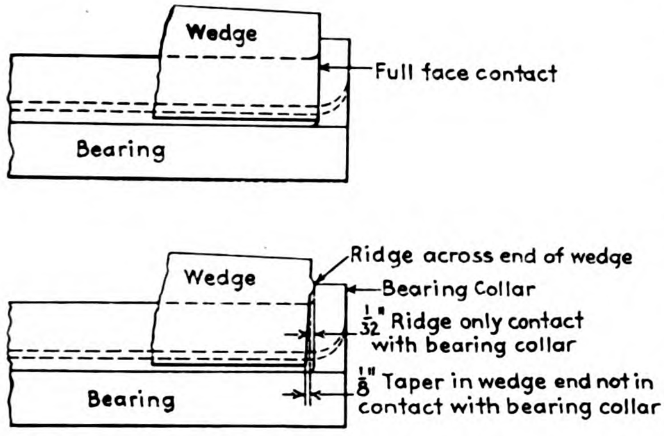
The present revised A. A. R. modified emergency bearing D-23 5-29-42-A which conserves strategic metals



Curves showing higher operating temperatures of journal with plain-back bearing as compared with one having a depressed-back bearing—Temperature of the bearing itself also is proportionately reduced

and modified journal bearings having bronze backs and babbitt linings that reducing the lining thickness is beneficial to lowering the running temperature; and that reducing the thickness of the back to the minimum for relined bearings results in no appreciable decrease in load-carrying capacity or increase in running temperature.

Based on these conclusions, the committee made the following recommendations: (1) that the design of the A. A. R. modified bearing be changed to reduce the weight of both the backs and the linings through the dimensional and tolerance changes shown in drawing D-23 5-29-42A which has been included in the Mechanical Division Manual of Standard and Recommended Practice; and that (2) in the interest of the national emergency and the necessity for the conservation of strategic metals in car journal bearings the changes incorporated in the proposed design modifications should be put into effect at once.



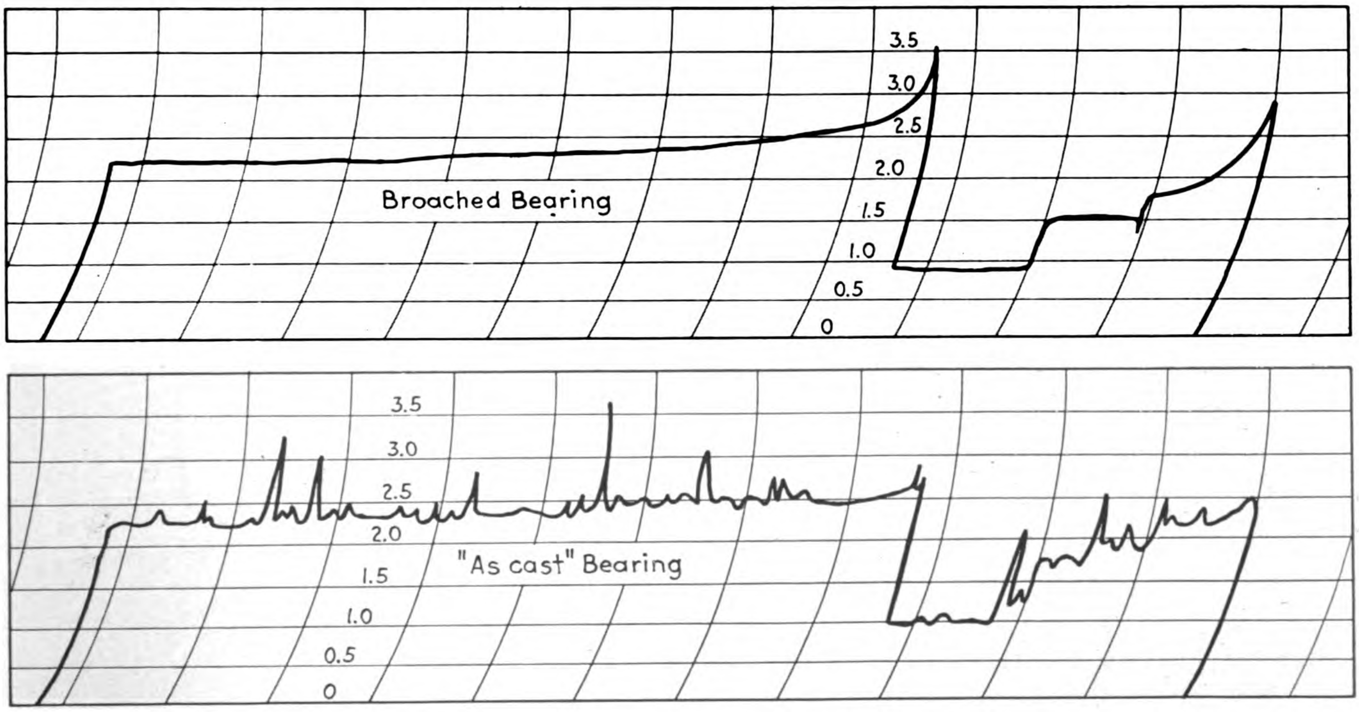
Above: Good practice, with standard-length square-end wedge which places the bearing collar in shear only—Below: Prevalent bad practice, with collar in bending stress due to ridge and taper on the wedge end

Southern (England) Mixed Traffic Locomotives

The Southern Railway of England is building a class of ten three-cylinder single-expansion locomotives of the 4-6-2 type in which are incorporated a number of features not regularly employed in British practice. These locomotives, which are intended for passenger and freight service, are streamlined or "air-smoothed" and are known as the Merchant Navy class. Each locomotive bears the name of a British shipping line, the house flag of which is included in the decorations on the side of the locomotive casing. The locomotives carry a boiler pressure of 280 lb. per sq. in. The driving wheels are 74 in. in diameter and the tractive force 37,500 lb.

The casing enclosing the engine is carried on the main frame and the boiler is free to expand inside of it. It is fabricated by electric welding from rolled sections and $\frac{1}{16}$-in. steel sheets. The cab is a continuation of this casing and, like it, is carried on the frames.

The casing in front of the smokebox door acts as an air collector. An opening over the smokebox door forms the mouth of a funnel, tapering to a narrow slot around the stack, through which a stream of air is discharged



Smooth power curve for broached bearing (top) and relatively rough curve for as-cast bearing (bottom)—Major disturbances in the latter indicate momentary metal-to-metal contacts with possible lubrication failure and resultant overheated bearing

upward at high velocity to act as a smoke elevator. Between the frames in front of the smokebox there is an electric-light turbo generator and two mechanical lubricator pumps. These are said to be the first English locomotives to be completely lighted by electricity.

The Principal Dimensions and Weights of the Southern Railway of England 4-6-6-4 Type Mixed Traffic Locomotives

Year built	1941-42
Service	Fr. and pass.
Rated tractive force, lb.	37,500
Weights in working order, lb.:	
On drivers	141,100
On trailing truck	31,360
On front truck	34,720
Total engine	207,200
Tenders	112,000
Driving-wheel diameter, in.	74
Wheel bases, ft.-in.:	
Driving	15–0
Engine, total	36—9
Engine and tender	59—6
Cylinders, number, diameter and stroke (in.)	3—18 x 24
Valve-gear type	Bulleid
Valves, piston type, size, in.	11
Maximum travel, in.	6¼
Boiler pressure, lb.	280
Diameter first ring inside, in.	69¾
Thermic syphons, no.	2
Tubes, number and diameter, in.	124—2¼
Flues, number and diameter, in.	40—5¼
Length over tube sheets, ft.-in.	17—0
Grate area, sq. ft.	48.5
Heating surfaces, sq. ft.:	
Total evaporative	2,451
Superheater	822
Combined evaporative and superheater	3,273
Tender:	
Water capacity, Imp. gals.	5,000
Coal, long tons	5

The boilers of these locomotives have steel inside fireboxes and are fitted with two Thermic syphons. Both the inner and outer fireboxes are welded.

All of the wheel centers, both engine and tender, are patented double-disc steel castings. The driving wheels are fitted with clasp brakes.

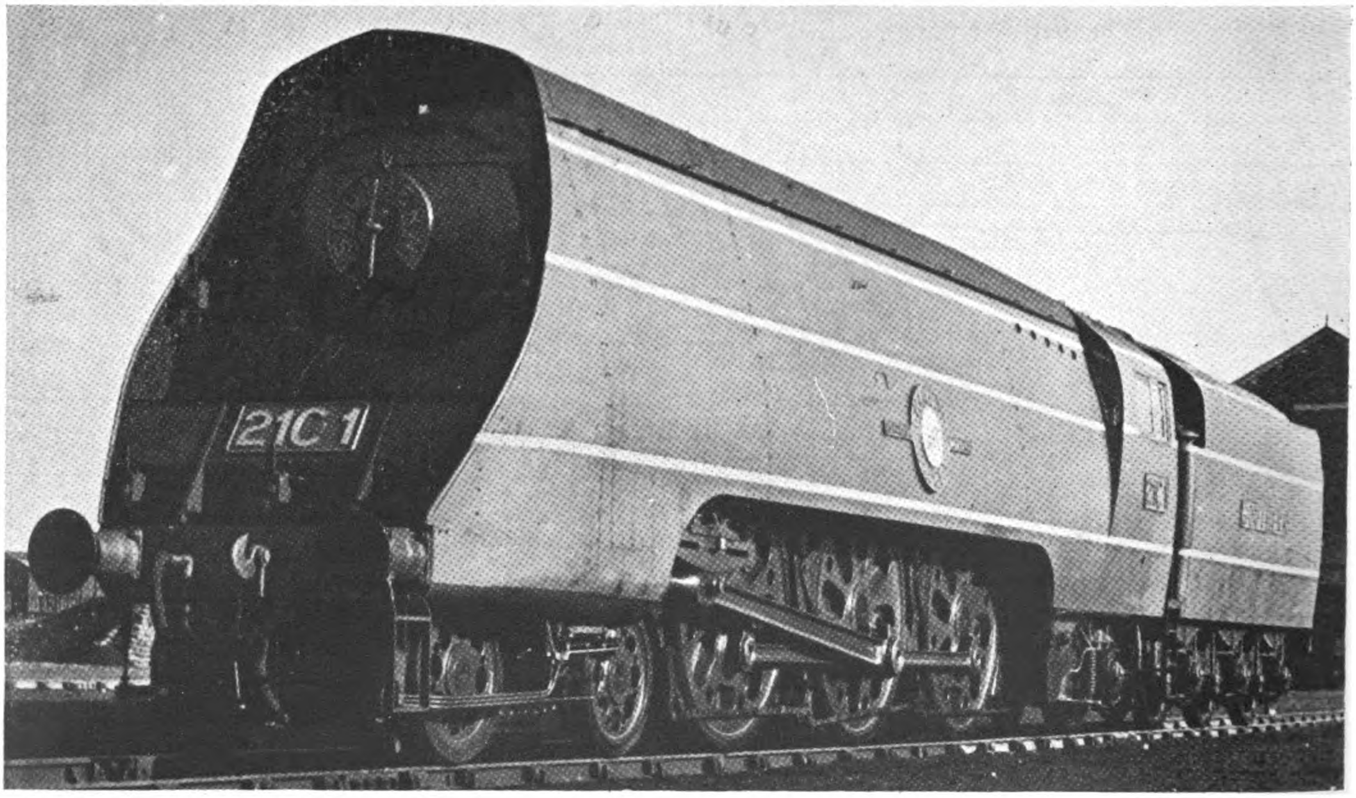
Among the innovations in these locomotives are a power-operated reverse gear and a steam-operated fire door. The locomotives are fitted with the Bulleid patent valve gear. The three sets are enclosed in an oil-tight casing inside the locomotive frames. This also encases the middle connecting rod, crosshead, and crank. All bearings within the casing are force-feed lubricated.

The tenders above the frames are welded. The water-filling holes are placed at the front end of the tender. These are accessible through covers in the tender cab at each side and make it unnecessary for the fireman to climb out over the top of the tender to take water.

The locomotives are numbered in accordance with a new system of notation of the Southern Railway. This gives both the number of the individual locomotive and an indication of the locomotive wheel arrangement. The number of driving axles is indicated by a letter of the alphabet, in this case "C" for the three pairs of driving wheels. The first numeral indicates the number of carrying axles in front of the driving wheels and the second the number of carrying axles behind the drivers. The final numeral is the serial number of the locomotive in the class.

The principal dimensions of these locomotives are shown in the table.

Oil Loadings Break Records.—The railroads continue to break records in hauling oil to the east coast. On August 1 a new plan was inaugurated setting up schedules for the established routes which eliminate delays in yards and terminals and at interchange points. Cars are moved in blocks and solid trains. Returning empties are handled in much the same manner as the loaded movements. According to Petroleum Coordinator for War Harold L. Ickes, a new record for rail shipments reaching the seaboard was established during the week ended August 15, an average of 830,820 barrels a day being handled.



The "Channel Packet" of the Southern Railway of England

EDITORIALS

Reclamation Vs. Economy

The extent to which the war spirit of getting things done regardless of cost has spread from our national government through general industry and the railroads is indicated by the following comment of a responsible car department officer, who said: "We're extremely busy here trying to do a first-class job and succeeding pretty well, with bad orders down to about two or three per cent. But it sure keeps a fellow scratching his head to provide material; saving this; repairing that; and substituting one material for another. Fortunately, we have been pretty well organized and equipped for economical reclamation in the past, but now it is *reclamation* and to heck with *economy*—Keep Them Rolling—and we certainly do."

Your Responsibility To Our Country

A peculiar American trait is that of indifference to the things that do not seem to be of immediate and personal concern. This characteristic has been called by a number of names. In one of its forms it is labeled "buck passing"; a variation of this is the "let George do it" attitude and now, with the war on, it comes up with a new, and somewhat high-brow name—complacency.

The accusation that the American people are complacent in these serious times has brought forth a storm of protest from some quarters and the good, old-fashioned American silence from the other 90 per cent. Those who rise in protest demand to know, "who's complacent—and about what?"

These columns are not, of course, the place to take up a consideration and attempted solution of the affairs of the world. During business hours at least, we can assume that someone else is charged with that responsibility. Our interest at the moment is the affairs of the railroad industry, and specifically the problems of the mechanical department, for in that small sphere of activity there are several things that none of us can afford to be indifferent about, no matter how much we may be inclined to think that they are of no personal concern. There are things going on that every railroad man should know about and, having been informed, do something about; upon such decision and action may depend a very important matter having a major influence upon the winning of the war—the successful functioning of rail transportation.

In order to appreciate certain facts relating to the railroad business and the manner in which you can play an individual part it may be well to remind ourselves of these things:

(1)—At the outbreak of this war, just as in 1917, the necessity of setting up governmental agencies charged with the prosecution of the war effort caused a segregation and classification of the users of materials and industrial products which, in a broad sense, resolved itself into two major divisions, military and civilian. The railroads, along with most industrial organizations, automatically fell into the latter group. Gradually, however, many industries, such as the automotive, were converted to defense work and in the minds of government representatives ceased to be civilian and became military. The railroads, however, were not "converted" and thereby remained in the civilian category.

(2)—In order to make sure that first things came first and that critical materials went where they were needed most in the shortest possible time the government set up OPM and the priorities system. Priorities are still with us but OPM is now WPB.

(3)—Under the priorities system it was but natural that materials and supplies should, in the early months of preparation at least, go to the military establishment and that civilian needs would be of secondary importance. Under such arrangement the railroads had, and are still having, difficulties in getting what they need.

(4)—The major importance of aircraft to the fighting forces removed the immediate threat of air transport as a competitor of the railroads and the activities of the Japs in the Far East literally pulled the "feet" out from under our major competitors, the bus, truck and private automobile, all of which coupled with a wartime industrial effort has thrown onto the railroads a traffic burden that was not anticipated and for which they were not in all respects fully prepared.

(5)—In the nine months we have been at war the railroads of this country have done one of the most remarkable jobs in all their history and are now handling freight and passenger traffic in a volume that is exceeding pre-depression highs with far less equipment than they had, for example, in 1929. This statement is ***not*** made to record, with pride, an accomplishment but to serve as a warning of unpleasant things that may happen if the proper steps are not taken.

(6)—No sane-thinking person could help but be soberly conscious of the rapidly growing importance of the railroads to the war effort. Certainly they're not part of the fighting forces but there could easily come a time when the fighting man at the front would be impotent unless food and the ammunition for his guns can be moved to the transport's dock when and in such quantities as it is needed for the job at hand. In this respect there might easily develop a situation in which rail transport would be of equal importance to the mili-

tary establishment. For, without the one, the other is helpless.

(7)—The warning in the previous paragraph is issued because of a certain fact about which too many people in both railroad and government circles may be indifferent—call it complacency, if you wish—and that is that never in all the history of railroading has equipment been operated under such pressure and worn out at the rate that it is today. Certainly, modern power is making it possible to haul heavy train loads at passenger-train speeds. On many roads as little as one-third of the motive power is handling from 50 to 60 per cent of the freight and passenger traffic. The truth of the matter is that without this modern power the job just couldn't be done at all. However, the important point is *the rate at which equipment is being worn out.*

(8)—In ordinary times the railroads experience their major traffic peak in October, with a decided falling off after the peak—in other words, a chance to catch their breath. October, 1941, was such a peak period during which records were made in tonnage handled and in the utilization of motive power. But after the peak of last October there was no breathing spell. Each month since then road after road has experienced traffic increases to the point where many are now at all-time highs—and the process of wearing out equipment still goes on.

(9)—The railroads, in many cases, are doing without equipment and materials that soon will be desperately needed to insure the continuity of the present high-grade service; they are at times being put under pressure by those without knowledge of facts to devote part of their energies to the production of things not related to rail transportation; they are, possibly, being "complacent" about symptoms that indicate trouble ahead; they are, in many cases, assuming that, being good railroaders, they can handle anything that comes along. As to this, the history of the past 24 months is replete with the records of what happened to others who felt the same way.

So, what can be done about it? Just this! Don't guess, know! If you mechanical men haven't got what you're going to need to put all your power through the shop in double-quick time, do something about it, now. If you haven't got the equipment you must have to do a job don't sit around telling yourself there's no use asking because you couldn't get it anyway; ask, yes demand, and keep on asking until you get it or find out why. If WPB or some defense contractor wants a war production job done, don't just arbitrarily decide that you can't do it; find out, without any guesswork, whether you have some excess shop capacity that you could devote to the job and if you haven't got it without interfering with your major job of keeping the railroad running don't be a bit backward about saying "no" and producing the facts to prove your point.

Remember, your responsibility is to keep the railroads running for without them battles may be lost. And, anyone, from now on, who fails to keep in mind how rapidly equipment is wearing out and fails to do something about it while there's still time is not only falling down on the job but—well, you name it.

Move the Cars But Have Them Safe to Move

An ever-present danger in times like these, when cars are moving over the rails more miles per day and, in many cases, at speeds higher than were contemplated when they were designed, with quicker turn-arounds and more urgency in getting them past interchange points, is that the fact may be lost sight of that the A. A. R. Rules of Interchange have not been relaxed in any way that permits the movement of cars not fit for line service to continue on their journeys. It is true that technical violations of these rules might be overlooked in order to permit loaded cars to go to destination if running and draft gear, brakes and safety appliances are in proper order and working condition. In case of doubt, however, on any mechanical or structural question, the best rule for car inspectors is still the rule of safety. Have the defect corrected before the car is permitted to travel further and possibly endanger the lives of members of the train crew or passengers on a passing train. A delayed car may result in inconvenience to the consignee, perhaps even slow down a plant's war production for a matter of a few hours, but a train wrecked because of a defective car will inconvenience and delay many more plants.

We have been assuming that all of the railroads are maintaining adequate and well-trained inspection forces and that there are no orders issued on any of them to encourage car inspectors to relax their vigilance with respect to dangerous defects. That this assumption might not be correct has been evidenced particularly in the observation of spread-side cars on the lines of a number of roads; it has also been noted in the lack of adequate side bearing clearance on cars running on tangent track at train speeds which were not too great to permit accurate observations. Other potential-accident defects are not so readily detected without closer inspection of the cars when they are in a standing position. But, the existence of defects of the nature mentioned suggests that others may also be getting past the inspectors.

There is no intention here to place blame on inspectors or on supervisors or on management. We don't know where the responsibility rests for the conditions apparently existing. We do know that, in the final analysis, it rests on management to determine whether it, itself, is at fault or whether, having provided sufficient working forces and equipment, personnel is not measuring up.

Vital as are the speedy handling and movement of freight cars today there is still no excuse for compromising with safety.

Artificial Material Shortages

Our English contemporary, the Railway Gazette of London, states that, with government control of railways, political interference increases and if "reforms" are promoted in the interests of the entire community they must be accepted when sound in principle, even though apparently somewhat ill-founded from a practical standpoint. Too often, however, such reforms and interference with railway operation are inspired by political motives which are sectional rather than national in interest.

In connection with the reduction of dining-car service in England, for example, any extra space for travelers which might be made available by the withdrawal of these cars would be small and the cars would not be easily adaptable to other service, consequently occupying storage track space better devoted to other useful purposes. The Gazette goes on to say that, in some political circles, there seems to be a tendency to interpret equality of sacrifice in terms of the greatest discomfort to the greatest number, and not to bother too much as to whether in achieving that end any practical advantages accrue.

It cannot be questioned that in this country, also, many steps have been suggested and actions taken not so essential from a practical standpoint as aimed at the objective of making the public generally, and railroad men in particular, "war conscious." That goal has now been achieved and from this time on it seems obvious that restrictions on equipment and material use should be limited to actual necessities, as determined by accurate balancing of what is actually available against the needs.

More Fusion Welding Of Cast Iron

It is estimated that about 90 per cent of all cast-iron welds are now made with the use of bronze welding rods, this method being generally popular and widespread in application because the welds are easy and economical to make and also show desirable physical characteristics as regards strength and ductility. Bronze welding is not always feasible, however, owing to the color difference, due to the fact that the castings may be subjected to high temperatures, or, more recently, because of scarcity of the bronze welding rods which are available only for work having a high priority rating.

Welding operators in railway shops are thoroughly familiar as a rule with bronze welding procedure in the repairing of defective gray iron castings but most of these welders have had relatively little experience in the fusion welding method which involves veeing out and melting the cast iron at the edges of the crack or other defect and filling in with additional molten iron from cast-iron welding rods. In order to secure satisfactory results in the fusion welding of cast iron, it is necessary for the welding operator to know something about the grade of casting to be welded and also have some idea of its chemical composition and physical properties so that he may understand how the application of heat will affect these properties and consequently be in a position to use the correct welding procedure.

Commercial cast irons, with about 93 per cent iron, 3 to 4 per cent carbon, and small proportions of other elements such as silicon, sulphur, manganese and phosphorous, include white cast iron with a white fracture which is difficult to file; gray cast iron with a grayish-black fracture which can be easily machined or filed; malleable cast iron which has a lighter fracture at the surface and can be easily machined and moderately bent without breaking; and alloy cast irons which may be any one of the three types previously mentioned and must usually be referred to the manufacturer for recommendations regarding chemical composition and necessary heat treatment.

In addition to some knowledge of the metallurgy of cast iron, especially the effect of carbon on its physical properties, and how to identify the different grades of cast iron, it is important for operators to learn how to prepare the defective surfaces for welding, provide for expansion if required, decide what degree of preheating is necessary, control the flow of metal without under or overheating and see that the rate of cooling or annealing is such as to give the best physical properties obtainable with each particular type of casting. Some railroads have already made real progress in training welders for a more general use of cast-iron welding rods and it is apparent that this training program should be extended.

New Books

MECHANICAL ENGINEER'S HANDBOOK. FOURTH EDITION. *Edited by Lionel S. Marks. Published by the McGraw-Hill Book Company, Inc., New York. Sixteen sections. 4¾ in. by 7 in.; bound in red leather. Price, $7.*

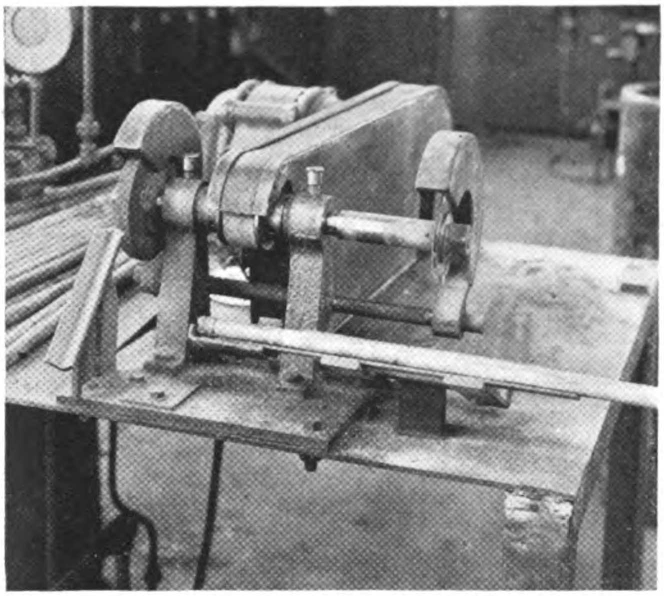
Most of the sections of the fourth edition of Mark's Handbook have been completely rewritten in order to include the more important knowledge and points of view on standardization of machine elements, of material, and of processes which have been developed by engineering societies and other organizations since the 1930 edition. Among the new subjects are the theory of models, plastic behavior of materials, stress concentration, creep, packings, wind pressure on structures, sound and noise, automatic control of processes, and powder metallurgy. By the exclusion or condensation of matter which has become, or is becoming, obsolete, and by omitting the condensed statements of the A. S. M. E. Power Test Codes, the work has been kept within a single volume.

Reclaiming Copper Tubes By Welding

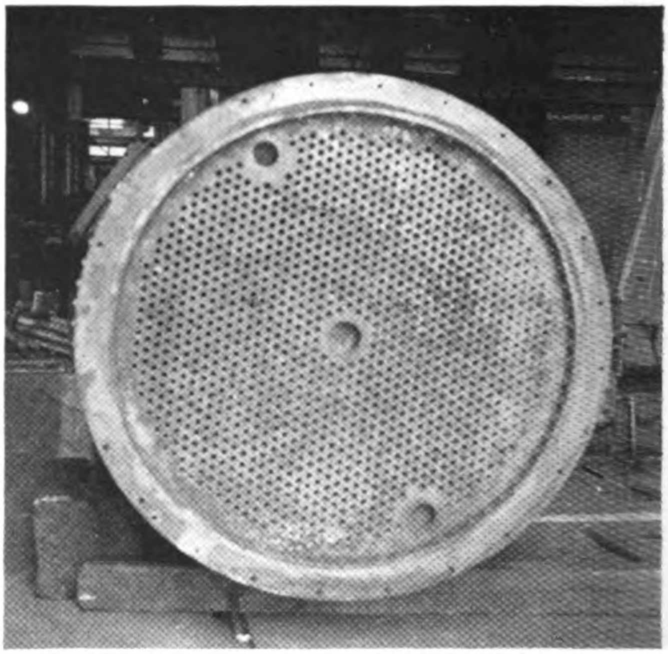
Before the present acute shortage of copper it was customary on one large railroad to scrap the copper tubes removed from electric locomotive heating boilers at the time of the required four-year inspection of the boiler interiors. Now they are reclaimed by welding. In removing these tubes they are drilled out of one tube sheet and cut off from the tube sheet at the opposite end of the boiler. The copper tubes, originally 3/4 in. by 36 in., are of a length which is of no value in any other application to any of the railroad's equipment. In the center of one of the illustrations is shown the condition of the ends of these tubes when they are removed from the boilers. On the right are shown tubes as prepared for welding; on the left they are shown as welded.

As it became impossible to obtain the number of copper tubes required for installations—there are 1,250 in each boiler—the railroad's supervisor of welding and other of the mechanical department officers considered the possibility of reclaiming the tubes by safe-ending. Experimental operations were so successful that a shop unit was set up to handle the reclamation on a production basis. At the present time about 80 per cent of the tubes removed are returned to service after being safe-ended and properly tested at the working pressure of the boilers, 250 lb. per sq. in.

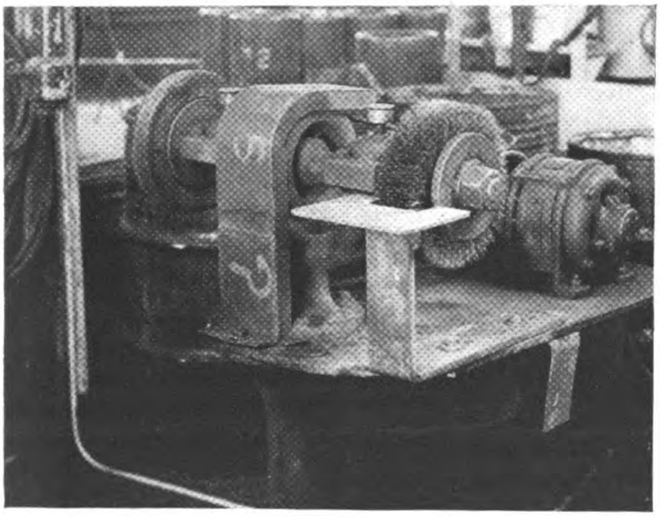
Ram for straightening the tubes



Cut-off saw and grinding wheel for beveling the tubes and safe ends



Top tube sheet of one of the locomotive heating boilers



The wire brush and burnisher used for cleaning the finished tubes

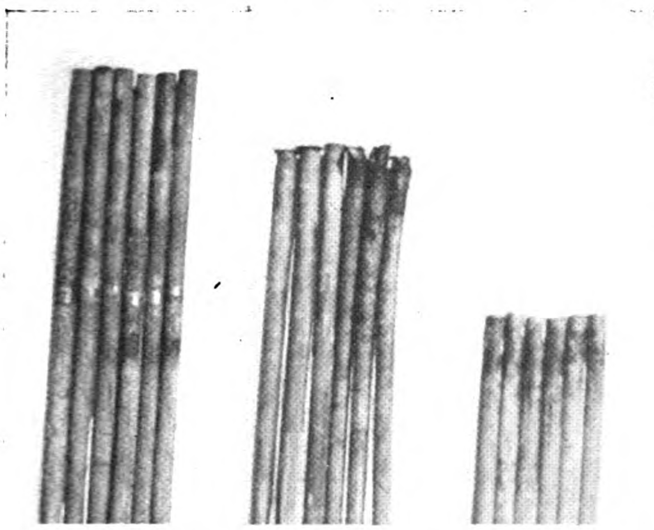
The first operation after the tubes are received from the boiler shop is the straightening of each on an air-operated ram. This ram is the exact diameter of the inside of the tubes and not only serves to straighten them but removes any dents in the walls. After straightening, the defective ends are cut off with a motor-driven metal saw. A 45-deg. bevel is ground on the end of the tube to be reclaimed as well as on the safe ends.

The safe ends are welded on by the oxyacetylene process using a bronze rod with the proper flux suitable for application on copper. The operator is able, through the use of a pedal-operated jig to revolve the tube as he holds his torch and rod in a single steady position.

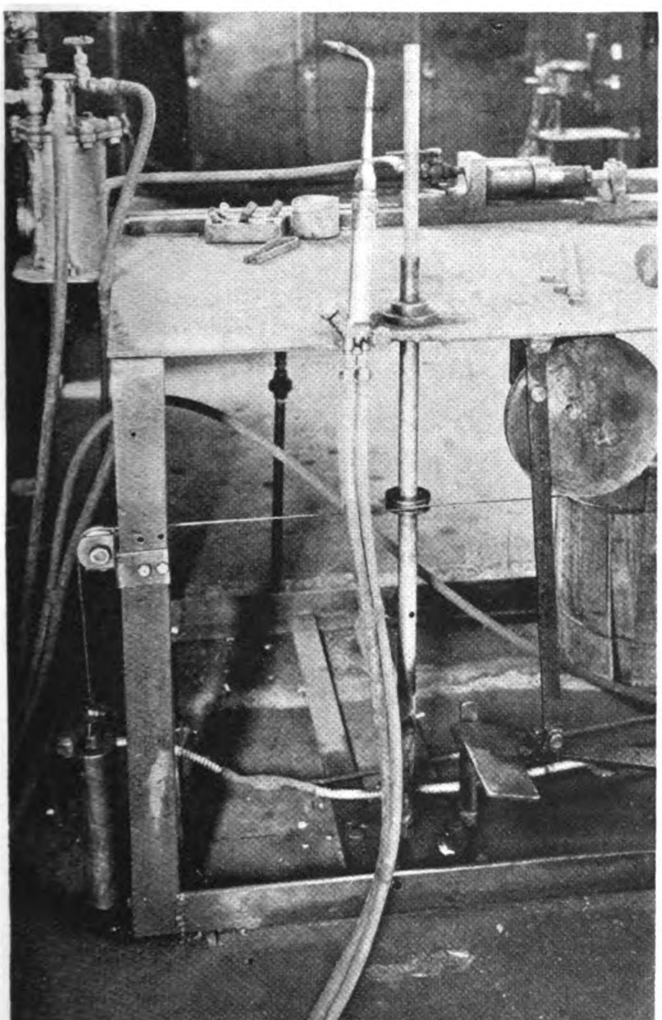
The jig is clearly shown in one of the illustrations. Depressing the foot pedal raises the counterweight through the action of an eccentric arm extending from the pedal to a drum over which runs a wire that has

been passed completely around a small operating wheel welded to a freely-rotating spindle. The two pieces to be welded are mounted on this spindle. A flux tank is conveniently located for the operator, as are the valves for the acetylene and oxygen lines.

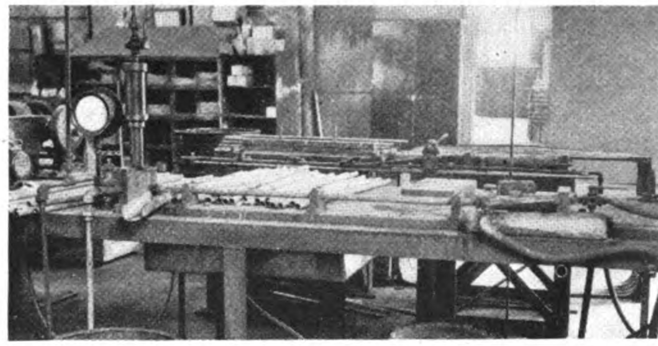
After welding, all tubes are given a working pressure hydrostatic test of 250 lb. per sq. in. When this test has been satisfactorily met the tubes go to a workman who, using a motor-driven wire brush, removes all scale and oxidation from the entire outside tube surface and finishes the polishing operation on a burnishing wheel.



Safe-ending copper tubes—Center: Tubes as removed from the boiler—Right: Ready for welding—Left: Safe ends welded on



The jig in which the welding is done

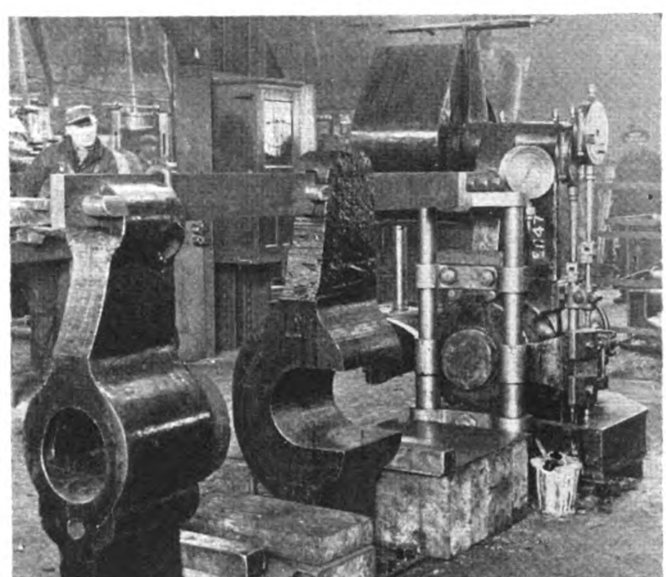


Hydrostatic-testing bench

This reclamation project has made it possible to return boilers to service promptly which might otherwise have been held up for lack of necessary materials.

A Horizontal Driving-Box Press

A horizontal driving-box press which has certain advantages over the vertical press ordinarily used, is shown in the illustration. It consists essentially of an old driving-wheel press, no longer adequate for mounting modern large driving wheels and axles and adapted by means of special equipment for the convenient removal and re-application of bearing brasses in driving boxes.

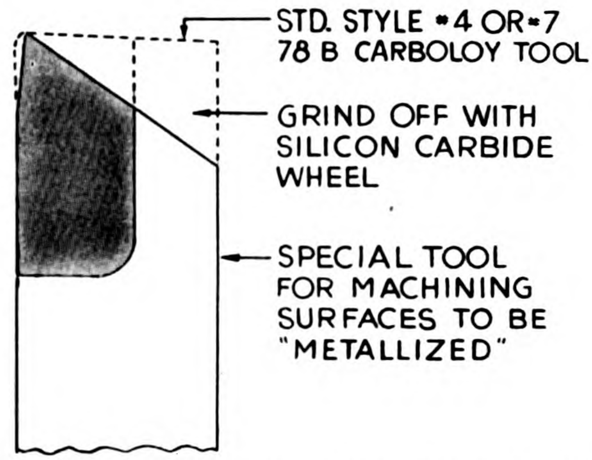


An old driving-wheel press adapted for removing and re-applying driving-box brasses

The driving box rests and can be easily moved on a steel-face block about 20 in. above the shop floor and having steel parallel bars of various thicknesses to support driving boxes of different size so they will come

at the correct height for pressing the brasses in or out. Two vertical 3-in. steel posts are located one on either side of the ram at the head of the machine. They are solidly anchored at the bottom to the base plate of the machine and firmly secured at the top by means of a heavy steel bracket bolted to the top rail.

A close examination of the illustration will show two substantial forged-steel jaws or clamps, which pivot on the 3-in. vertical posts and may be readily swung inward to engage the driving-box flanges when pressing a brass in or out, or swung back out of the way when the operation is completed and it is desired to put another driving box in place. The illustration shows these jaws swung back ready for placing another driving box in the machine. The machine has more than ample capacity to apply brasses in the largest driving boxes at pressures shown on the indicating gage.

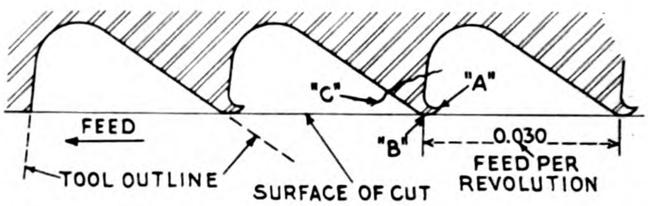


Tool grinding for preparation of parts to be metal sprayed produces best results when tools are "incorrectly ground"

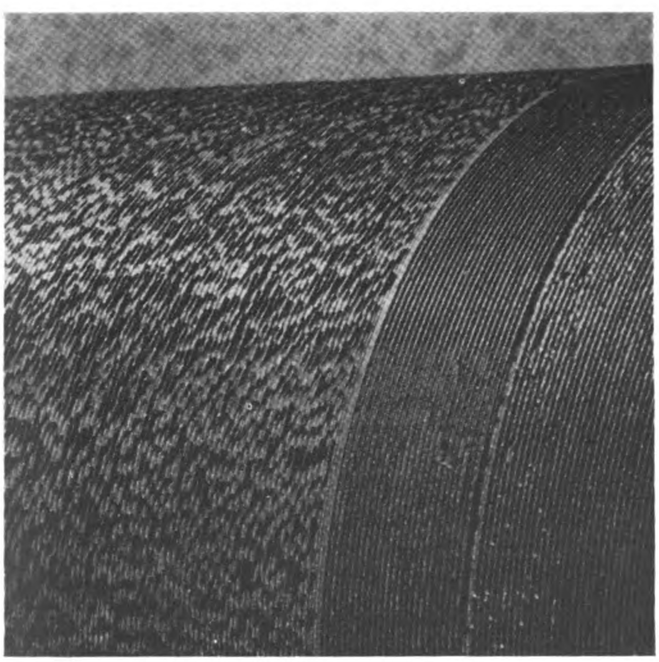
"Incorrectly" Ground Tools Produce Desired Results

Proper preparation of surfaces prior to metal spraying is readily done on hard-to-machine alloy steels, according to engineers of the Carboloy Company, Inc., by violating previously closely-adhered-to standards of tool preparation. Metal-spraying requires that the surface upon which metals are to be deposited shall be rough so that a proper bond will be formed between the parent metal and the metal being used to build up the piece in process. Difficulties were encountered in machining alloy steels to give a rough finished surface even when the best and most expensive of tool steels were employed; tool life was short and the cost of preparation was high.

Reasoning that, if a smooth finished surface could be obtained with a properly ground tool, rough surfaces would result from a tool ground opposite to standard practice, Carboloy engineers experimented. The drawing shows the manner in which a standard Carboloy Style 4 tool was ground and the photograph shows the actual results obtained. The other drawing is an enlarged view of the cut. At a feed of 0.030 in. and with a cut of 0.020 in. an ideal surface for metal-spraying was obtained. The "incorrectly ground" tool raised a burr between tool marks and the tool angle was such that it forced the burrs over into a horizontal position. Uneven crests were raised and a mottled surface produced as an ideal base for the adhesion of sprayed metal. Cutting speeds were around 200 surface feet per minute.



With incorrectly ground tools crests are lifted intermittently, at as "C" to produce an uneven surface to which sprayed metal will bond



An ideal surface for the application of sprayed metal is obtained when "incorrectly ground" tools are used. The surface on the left in the illustration will give the desired bonding between parent metal and sprayed metal

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Patching a Grooved Seam

Q.—What type of patch should be applied for reinforcing the shell course of a boiler because of grooving at the circumferential seam?—F. B.

A.—A typical patch for strengthening the shell course of a boiler to overcome a weakened condition caused by grooving along the circumferential seam is shown in the drawing.

The thickness of the patch should be the same as the thickness of the shell course to which it is applied. The circumferential portion of the patch, distance *A*, in the drawing should have the same size rivets and rivet spac-

ing as the circumferential seam to which the patch is applied. The distance *A* should always be longer than the grooving in the shell.

The ends of the patch should be designed in the same manner as those for a diamond patch. The efficiency of the ends should be at least equal to the efficiency of the longitudinal seam of the course to which the patch is applied. The efficiency of the seam along the outer row of rivets for distance *C* is computed by the formula:

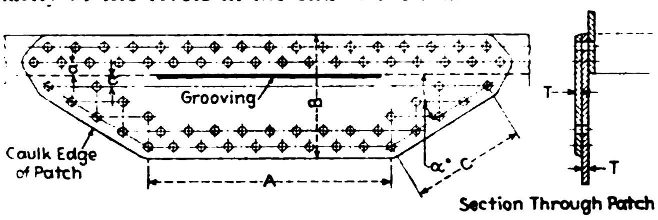
$$\frac{2\ (P - D)}{P\ \sqrt{3 \times \sin(\alpha)^2 + 1}}$$

where

P = pitch of rivets in outer row, in.
d = diameter of rivet hole, in.
α = angle, deg.

In designing the ends of the patch care should be taken so that the pitch of the rivets permits proper caulking.

The width of the seam *B* is determined by the angularity of the rivets in the end of the seam which is necessary to obtain the required efficiency. The first row of rivets in the patch adjacent to the circumferential seam should be spaced the same distance away from the circumferential seam as the rivets in the circumferential seam are spaced from the edge.



Circumferential seam patch to strengthen area after grooving

The Remedy for "Cool Down" Leaks

Q.—What are the causes and remedies for "cool down" leaks that appear in locomotive fireboxes around staybolt heads; that is, fireboxes which are tight in service and develop leaks upon standing and cooling down?—*J. F. J.*

A.—The cause is the expansion and contraction of the boiler which causes the staybolts to work in the sheet, resulting in leaky staybolts. Staybolts that leak slightly when the boiler is cool will tighten when the boiler is under pressure, due to the expansion of the boiler; also the staybolts that have been working in the sheet while the boiler is under pressure often will not show any signs of leaking until the boiler has cooled down.

This condition may also be caused by a rapid change in the firebox or boiler temperature due to the following:

1.—On stoker-fired engines, due to the light fire carried, the fire dies down rapidly when the engine is brought on the ash pit after a run, large holes forming in the fire allowing cold air to enter the firebox.

2.—The use of the injector by the hostler, putting cold water into the boiler.

3.—The opening of the fire door, while dumping the fire when over the ash pit.

4.—Using the blower while the engine is over the ashpit.

All of the above are common practices that tend to cause rapid changes of temperature in the firebox with its resultant effect on the firebox sheets and staybolts.

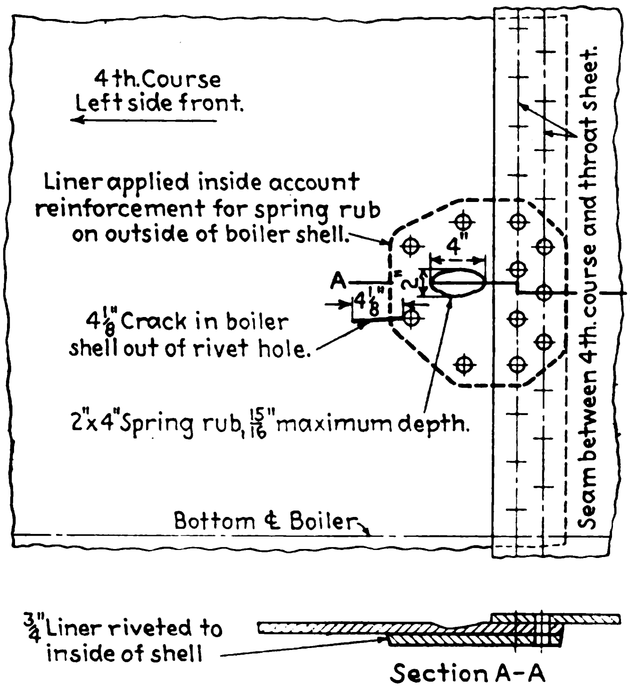
Care taken in cooling down a locomotive after a run eliminating as far as possible any rapid change in the temperature of the boiler will reduce staybolt leakage. Water treatment and continuous blowdowns are generally accepted as the best remedies for the prevention of leaky staybolts and cracked side sheets.

A Boiler Patch Calculation

By L. R. Haase

The patch shown was applied on the left side of the fourth course of a boiler shell which had previously had a liner applied on the inside of the boiler to reinforce a point worn by a rubbing spring. At a later shopping of the locomotive a crack in the boiler shell was discovered running from one of the rivet holes used in the application of the liner. It was decided to remove the liner and apply an outside patch as protection to the spring-worn spot and reinforcement for the crack.

A 3/8-in. hole was drilled at the end of the crack to prevent its further progress into the shell, the outside throat sheet was scarfed and the rear circumferential edge of the patch was set to suit the scarfed sheet. In order to utilize holes previously drilled in the boiler shell for the inside liner it was necessary to design a patch of rather unusual shape. However, it has the necessary factor of safety as shown by the calculations.



The original inside liner

The actual value of metal lost due to the crack is

$$L \times t \times TS$$

where

L = length of the crack, in. 4⅛ in. + 1 3/16 in. = 5 5/16 in.
t = the thickness of the fourth course, ¾ in.
TS = tensile strength of steel used in the fourth course, 55,000 lb.

$$5.3125 \times .75 \times 55{,}000 = 219{,}141 \text{ lb.}$$

The actual value of metal lost on the spring worn spot is

$$L \times t \times TS$$

where

L = length of the spot, 4 in.
t = thickness of metal lost, 5/16 in.
TS = tensile strength of steel used in fourth course, 55,000 lb

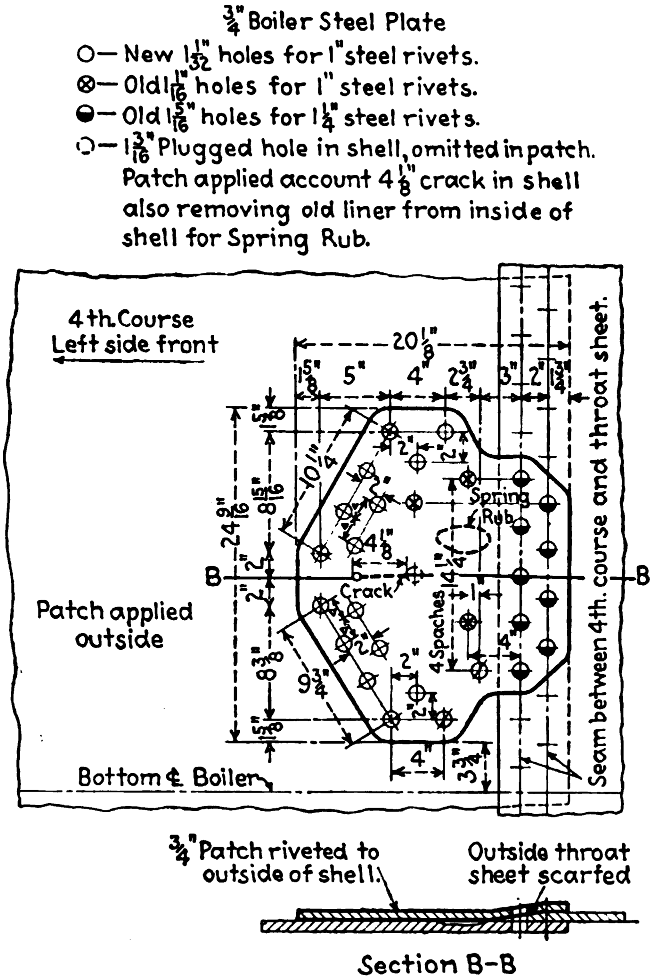
$$4 \times .3125 \times 55{,}000 = 68{,}750 \text{ lb.}$$

Total value of metal lost is the sum of these two or 287,891 lb.

After determining the value of the metal lost the number of rivets in shear required on each side of the patch is found by using the formula

$$N = \frac{\text{Value of metal lost}}{S}$$

where N is the number of rivets required, the value of rivets lost is 287,891 lb. and S the shearing value of one



Patch applied over crack and worn spot on boiler shell

steel rivet of 1 in. diameter driven in a 1 1/16-in. hole or 39,010 lb. per sq. in.

$$N = \frac{287{,}891}{39{,}010} = 7.3 \text{ rivets or approximately eight rivets required in single shear.}$$

It will be seen that there are sufficient rivets in shear on the outside patch and that they are placed to allow good caulking. It is necessary to find the efficiency along the angular line of rivets at the front of the patch to make certain that there is efficiency at least equal to the efficiency of the longitudinal seam. Without consideration of angularity the efficiency of the line of four rivets at the top of the patch is found to be 69.8 per cent and the line of four on the bottom of the patch is 68.3 per cent. Additional strength results from the angularity of the rivet lines which is 29 deg. 12 min. for the top line and 30 deg. 51 min. for the bottom line.

The factors for determining additional strength resulting from angularity are found by the use of the formula:

$$F = \frac{2}{\sqrt{3 \times (\text{sine angle})^2 + 1}}$$

the factors are 1.52 for 29 deg. 12 min. and 1.49 for 30 deg. 51 min. Multiplying the efficiency figures arrived at above by the factors now obtained actual efficiency for the top part of the patch is found to be 106 per cent and for the bottom line of rivets 101 per cent. The efficiency along the 9¾-in. bottom line of rivets being the lesser, it is used in the formula to find bursting pressure:

$$\text{Bursting pressure} = \frac{Ts \times t \times E}{r}$$

where

TS = 55,000 lb. per sq. in.
t = ¾ in., thickness of the plate.
E = efficiency of weakest line of rivets, 101 per cent.
r = the radius of the fourth course, 42⅝ in.

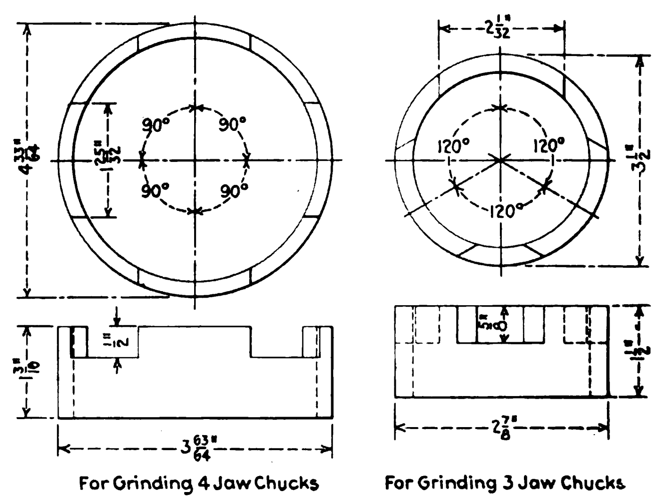
The result 970 lb. per sq. in. is divided by the working pressure of the boiler, 225 lb. per sq. in. and shows the factor of safety for the patch to be 4.31.

Two Devices for Simplifying Lathe Work

*By J. R. Phelps**

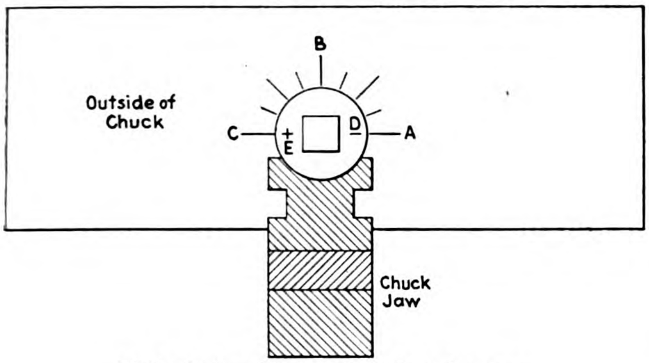
The drawing accompanying this article describes an idea, the value of which to a lathe operator will be immediately apparent. Any mechanic who has operated a lathe with a four-jaw independent chuck has no doubt often wished for an accurate method of setting the chuck jaws. Such a method is described here and consists simply of marking the ends of the chuck screws so that it is possible to set up hexagon, round, square or octagon work to within .004 or .005 in.

The first thing that must be done is to lay out and file



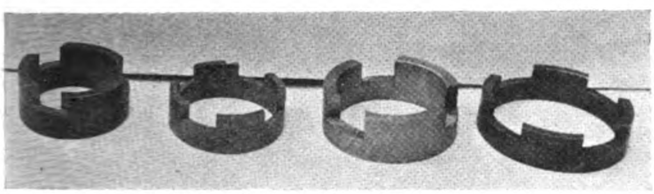
These easily made holding rings simplify grinding on worn jaw faces of lathe chucks

* Machine foreman, Atchison, Topeka & Santa Fe, San Bernardino, Calif.



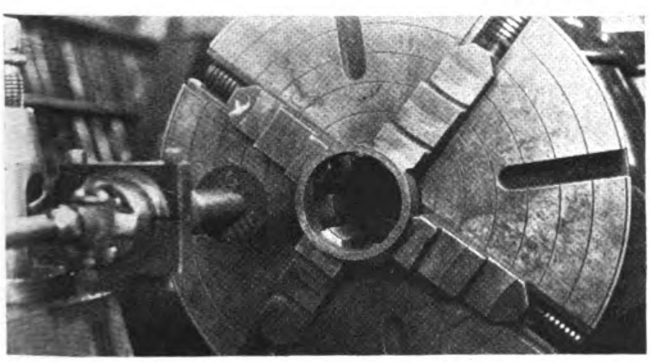
Method of marking chuck body and screws

or grind the lines *A*, *B* and *C* on the periphery of the chuck body. Next, take any perfectly round piece of steel and chuck it so that it runs within .001 in. of true. This setting should be made with a dial indicator. With the four chuck screws in this position, the straight lines



Rings used in holding three and four jaw chucks while grinding the inside faces of the jaws

indicated at *D* and *E* should be marked on the end of the screw, the line at *D* being exactly in line with the mark *A* on the chuck body and the horizontal line of the cross at *E* exactly in line with the line *C* on the chuck body.



This photograph shows a ring in place on a four jaw chuck which is ready for the grinding operation to restore jaw contour

The chuck screws are now permanently marked and when any piece of work which is symmetrical about the center is placed in the chuck, the marks on each of the four chuck screws at *D* and *E* should be in the same position with respect to the marks *A*, *B* or *C*.

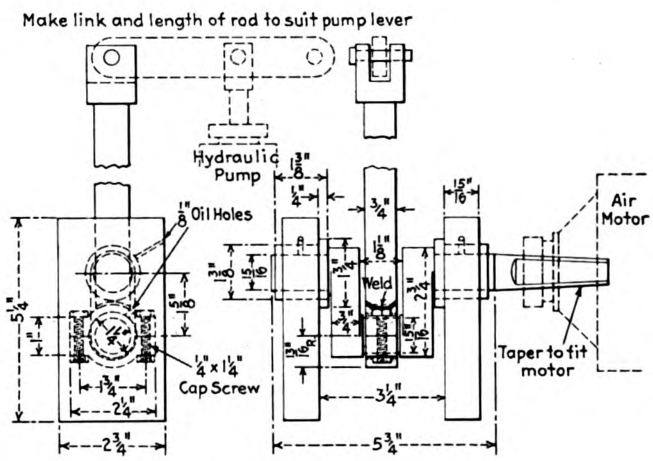
With this arrangement the lathe operator may set up a piece of work and start right in on the actual cutting operation. There is no necessity of checking the work with a piece of chalk together with the attendant starting and stopping of the lathe. In the shop with which the author is connected, 26 engine lathes have the chuck jaw screens calibrated in this manner.

Ring for Holding Chuck Jaws While Grinding

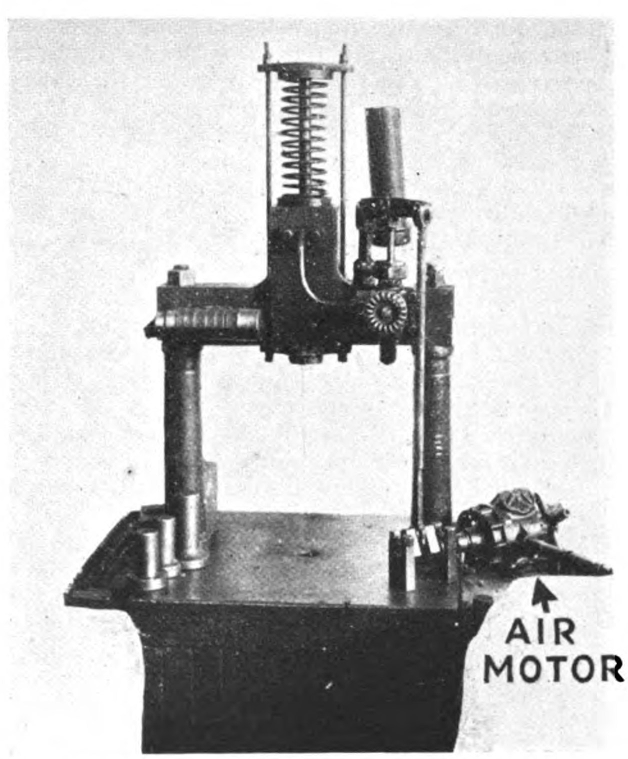
The accompanying drawing and photographs show a device for holding the jaws of a lathe chuck in proper position while grinding the inside face of the jaws. When chuck jaws become worn and require grinding it is customary, in this shop, to run them in on a notched ring such as the type shown in the illustration and, with a small portable grinder held in the lathe tool post, grind them out until they are cleaned up, after which they are removed from the chuck and the notches cut in on a grinder. The advantage of this grinding ring is that it holds the jaws in their proper position, with the pressure out, exactly as they are when they are clamped down on a piece of work.

Small Power Driven Hydraulic Press

The accompanying drawing and photograph show the details of a small bench-type hydraulic press, having a 3½-in. diameter cylinder, equipped with an air-motor drive. This press is one of several used in a large locomotive shop for work on locomotive valve gear bush-



Details of crank drive for pump arm



Air motor drive and crank shaft assembly on a small hydraulic press

ings. The drawing shows the details of the crank shaft, bearings and connecting rod which were designed for driving the plunger arm of the hydraulic pump. The connecting rod is a Model T Ford rod with a pipe extension and a jaw at the upper end for connection to the hydraulic pump arm. One end of the crank shaft has a taper shank to fit the air drill. The photograph shows the air-motor drive and crank shaft assembly on the press table. The crank shaft bearings, in this case, are small blocks secured to the table of the press with cap screws. On some presses of this type, in the shop where this device was developed, it was possible to connect the air motor and drive on a bracket on the press cross arm where it is entirely out of the workman's way.

Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Reclaiming Metallic Hose Connections

Q.—We have a great many damaged metallic steam hose that have been taken out of service because the threaded ends are jammed. This threaded end is very short and difficult to machine but it seems that there must be some way to reclaim these hose by welding.

A.—The simplest and quickest method of reclaiming these connectors requires no machine work and little welding. The damaged threaded ends are removed with the cutting torch. When cutting leave at least 1/8 in. of the original boss. Either in the pipe machine or with the cutting torch cut the threaded end from a piece of pipe or nipple of the correct size to replace the threaded portion removed. Vee this new piece on the emery wheel and weld it securely with mild-steel rod to the body of the connector. The joint will be ready to serve equally as well as a new one.

Removing Broken Studs

Q.—Would you suggest some methods to be used in removing studs around a locomotive?

A.—The principal method in daily use in most shops is to remove broken studs with the cutting torch and, in most instances, this method is entirely satisfactory. Naturally no one not experienced at cutting out broken studs should attempt this operation. This is especially true on or around the locomotive boiler. Occasionally, on some parts cutting out the broken stud with the torch may not be permitted. In this case a new and novel method may be employed. A scrap nut slightly larger than the broken stud is placed over the protruding end of the broken stud. The nut is welded to the exposed end of the stud by arc welding. The hole in the nut need not be filled as long as there is a good bond between the nut and the stud. When the weld has cooled slightly a wrench may be applied to the nut and the contrary stud backed out of the hole. The heat that the stud received during the welding operation seems to loosen the most stubborn stud and it comes out leaving a good clean hole.

Welding Reservoir Lugs

Q.—Can the broken lugs on cast-iron air-brake reservoirs be welded or rebuilt without preheating?

A.—Broken or worn lugs on these reservoirs can be welded or rebuilt with bronze without preheating. When rebuilding the lugs with bronze, a carbon plate can be placed in position under the broken lug and the desired amount of bronze built into place. When welding the lug back in place with cast iron, the carbon plate must not be used as the carbon picked up from the plate will harden the deposit to a point where it will be impossible to drill bolt holes. A much softer and better job will be obtained by placing the part to be welded in an upright position and rebuilding layer upon layer until the desired height is reached. This may take a little longer but the more satisfactory results will be justified. Excess metal can be melted from the lug and ground to size with a portable grinder.

Finishing A Cast-Iron Weld

Q.—There are times when I need to rough finish a cast-iron welding job to save machine work, however, when I attempt to melt the weld down I undercut it and have to rebuild. Will you recommend a method to follow in avoiding this?

A.—Several years ago before bronze welding became so popular many welders were very clever at cast-iron welding. After the weld was completed the welder would grip a heavy coarse file in his right hand and, holding the welding torch in his left hand, he would heat the area to be smoothed to a flowing heat. As soon as the metal began to flow he would make two or three quick passes across the surface with the file. Each pass removed some of the cast iron. This process is carried out until the part is reduced in size to suit the operator and a good square corner produced. The metal that adheres to the file is removed by striking the file sharply against the bench. Square shoulders, round lugs and all kinds of shapes and parts may be built in this manner.

Gas Cutting "Drag"

Q.—In cutting with an oxyacetylene torch what is meant by the term "drag"?

A.—In flame cutting, the cutting oxygen jet usually enters the cut vertically to the surface, in line with the cutting oxygen orifice axis. After traversing about one-half the thickness of the cut it may curve backward in a direction opposite to the travel. When this occurs, the amount by which the oxygen jet falls behind the perpendicular in passing through the material is known as the "drag" of the cut. Faint markings or ridges called "drag lines" left on the face of the cut enable this to be measured. Drag may be increased by either increasing the cutting speed or reducing the cutting oxygen pressure. In fact, the drag can be made to increase until the cut no longer penetrates entirely through the material. However, if the drag is excessive, slag which is hard to remove will adhere firmly to the bottom of the cut. On the other hand, to reduce the drag below a certain limit, a sharp increase in cutting oxygen consumption is required.

Satisfactory gas cuts must have a drag sufficiently short for the purpose intended and to allow cutting the final corner and "dropping" the piece. The sides of the cut should be square and smooth, not grooved, fluted, or ragged. There should be no firmly adhering slag on the bottom of the cut, as this requires an appreciable expenditure of labor for its removal. With proper adjustments, only loose slag, or none at all, is obtained. Finally, the upper and lower edges of the cut should be sharp enough

to meet the requirements of the particular job. Straight line cuts usually can be made with considerable drag without much detrimental effect because the drag lines lie within the plane of the cut and do not prevent both top and bottom edges of the cut being left clean and sharp. This procedure saves oxygen. In shape cutting, when rounding curves or corners, less drag is permissible, as the bottom contour of the cut will tend to come out differently from the top with the edges not square. Such cuts must be made with small drag and are known as "high quality" cuts. Precision machine flame cuts are necessarily of high quality.

Riveting vs. Welding In Tank Repairs

Q.—We are repairing several 15,000 gal. tenders by renewing the side sheets 12 in. up from the bottom for a distance of 102 in. The tank is of riveted construction with the side sheet riveted to the flanged bottom with 5/8 in. rivets having a 2 1/8-in. pitch. The side sheet is 1/4 in. thick. In applying this patch would it be satisfactory from the standpoint of strength to weld the patch in place using a 1/4-in. fillet weld along the bottom and a butt-weld along the sides and top of the patch?—M. E. F.

A.—It would be satisfactory to apply a welded patch as outlined in the question.

Safe allowable stresses for fillet welds in shear, using shielded arc electrodes, are:

Size of fillet weld, in.	Lb. per lineal in.
1/8	1,200
3/16	1,800
1/4	2,400
5/16	3,000
3/8	3,600
1/2	4,800
5/8	6,000
3/4	7,200

A 1/4-in. fillet weld 2 1/8 in. long would carry a load of

$$2{,}400 \times 2.125 = 5{,}100 \text{ lb.}$$

5/8-in. rivet, which requires an 11/16-in. rivet hole, has shear value of 12,000 lb. per sq. in.

The area of an 11/16-in. diameter circle is .37122 sq. in.

$$.37122 \times 12{,}000 = 4{,}454 \text{ lb., the load value of a rivet.}$$

Thus, the 1/4-in. fillet weld 2 1/8 in. long would be stronger than a riveted construction.

The working strength of butt welds of 100 per cent penetration into the base metal is usually calculated by multiplying the net cross-sectional area through the throat of the weld by 15,600 lb. for tension, by 13,600 lb. for shear, and by 18,000 lb. for compression.

With 100 per cent penetration the throat of the weld for a 1/4-in. plate will be 1/4 in.

Using the lowest value for the weld, we have

$$.25 \times 2.125 \times 13{,}600 = 7{,}225 \text{ lb. — load carried by 1/4-in. butt weld 2 1/8-in. long.}$$

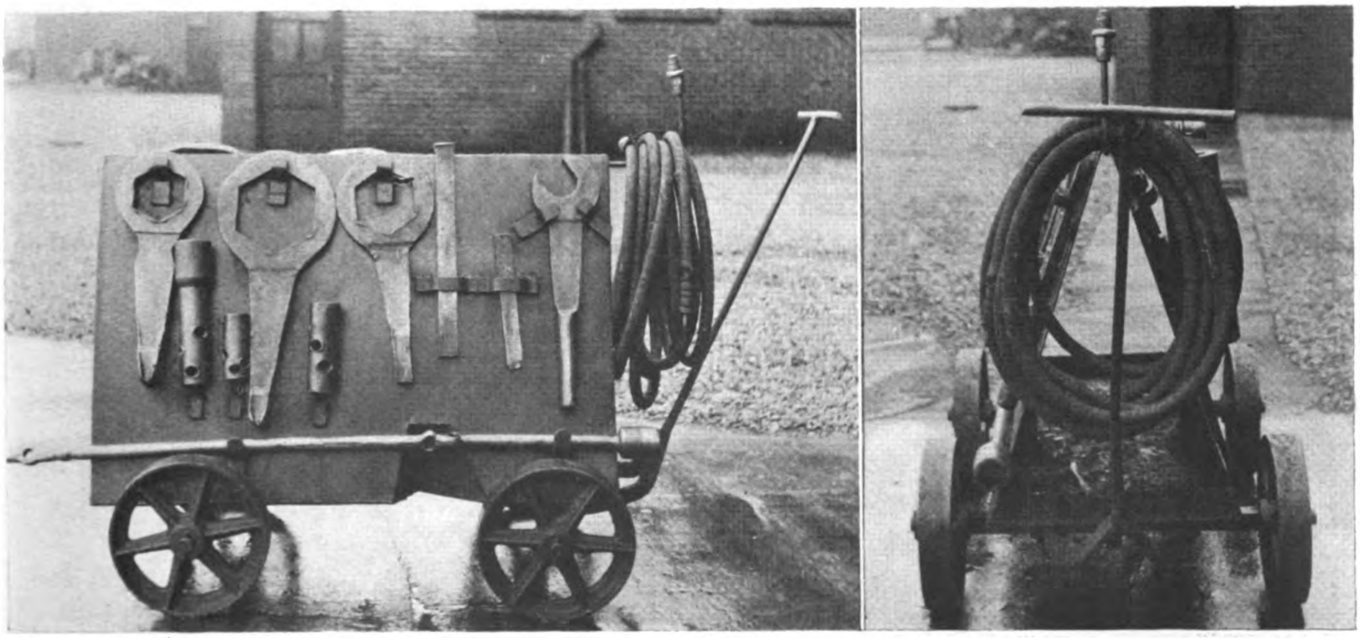
Load carried by 5/8-in. rivet = 4,454 lb.

Thus, a 1/4-in. butt weld 2 1/8 in. long would be stronger than the original construction.

Shop Tool Wagon

The illustration shows a shop tool wagon, used at the Chesapeake & Ohio shops, Richmond, Va., which is adaptable, with some variations in design, to carrying many different kinds of tools required in locomotive maintenance work. In particular among the tools, are wrenches of various kinds required on the rod and crosshead job—special open-end wrenches, large box wrenches, socket wrenches, etc. The wagon provides a convenient means of transporting these tools to and from the locomotive; tends to prevent losing the tools and keeps them always in a particular place where they can be readily located; and also avoids the throwing of tools on the ground or shop floor, even temporarily, where they become a hazard.

The tool wagon consists of a welded steel body, made of relatively thin sheets so as to minimize the weight, and is carried on four truck wheels, one pair of which is designed to swivel under the movement of the handle. The body of the wagon is undercut to permit making sharp turns. The wagon sides are inclined and meet at the top in the form of an inverted V. On the sides are welded the light steel straps which serve to hold individual wrenches and tools. The front of the wagon carries a hook and length of air hose which may be used for the operation of pneumatic tools or grease guns as required.



Tool wagon used at the C. & O. locomotive shops, Richmond, Va.

Expediting

Southern Pacific Car Work

A notable record of achievement has been made in recent months on the Southern Pacific by the prompt servicing and efficient handling of an unprecedented number of passenger and freight trains, first consideration being given in all instances to those trains used to move troops and war materials. Facilities have been studied and equipment installed to expedite car handling in yards, at division points and in general repair shops such as those as Sacramento, Calif., where the labor-saving devices illustrated in this article have been largely developed.

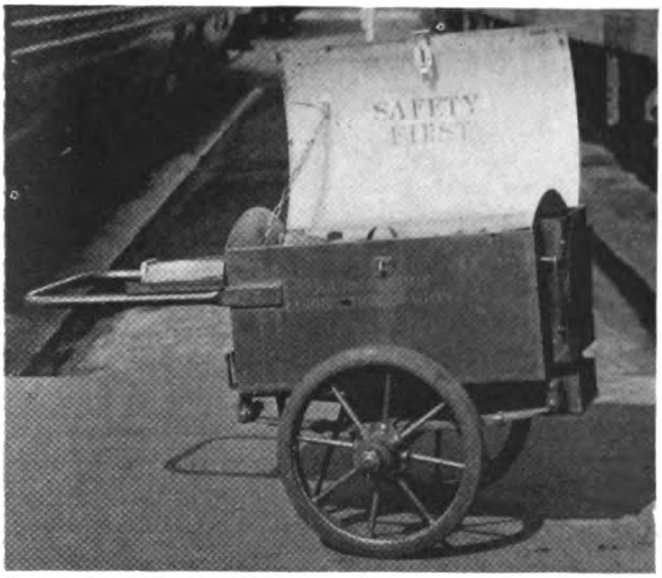


Fig. 1—Typical lubrication wagon used on the Southern Pacific

In connection with lubrication of rolling stock, the Southern Pacific has found that equipment which is easily portable is the best insurance for a thorough and rapid lubrication service. Lubrication wagons, shown in Fig. 1, are an example. They accommodate all necessary items, including covered cans containing saturated waste and oil, journal jacks, jacking blocks, extra brasses, etc. Fig. 4 shows an oil lubricator wagon used for filling journal boxes and mechanical lubricators. It consists of a certified tank accommodating from 15 to 20 gal. of oil and is charged with air from a hand pump mounted on the wagon, saving much time and labor and eliminating the use of cans and hand-operated oil guns. These lubrication wagons keep oil clean and free from foreign matter, and speed up servicing of cars and locomotives.

Similarly brake-shoe wagons of the type shown in Fig. 2 have been built to hold 50 brake shoes, and as new ones are applied to cars old ones are removed and conveyed to scrap bins. Portable lamp wagons are used for picking up and distributing inspectors' and carmen's lamps, saving considerable expense and labor and eliminating the damage frequently done to lamps when handled in trucks. One of these lamp wagons is illustrated in Fig. 3.

Fig. 5 shows a portable propane tank wagon and scale

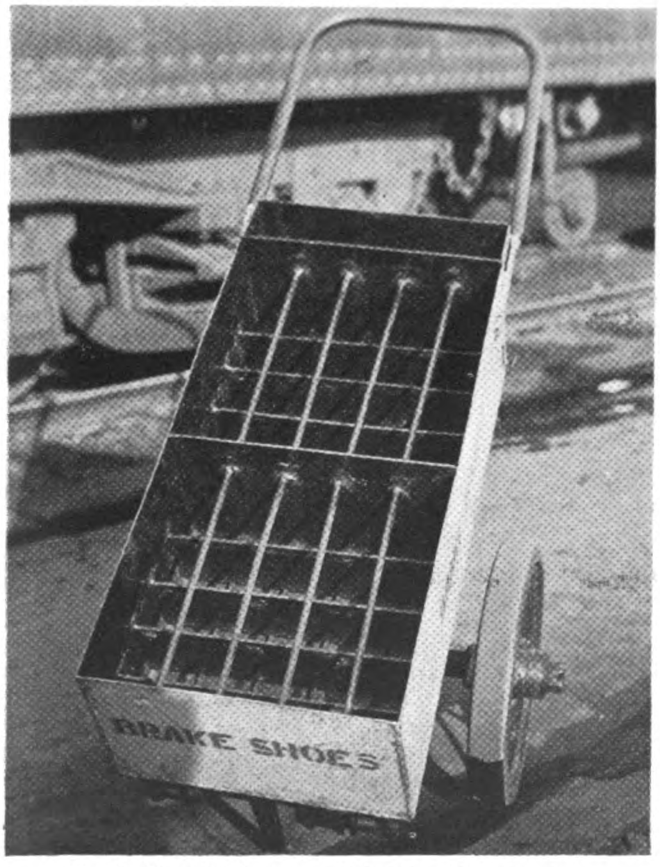


Fig. 2—Two-wheel wagon which holds 50 brake shoes

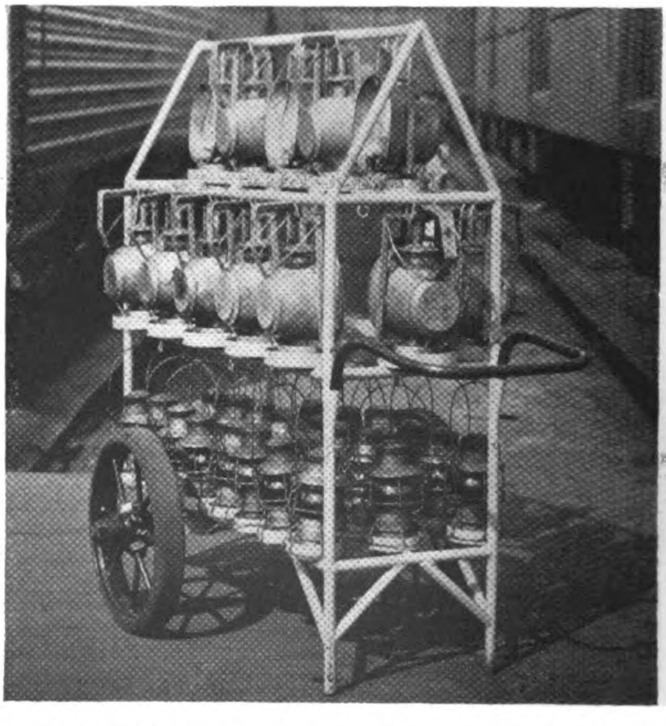


Fig. 3—A lamp wagon which saves labor and lamp breakage

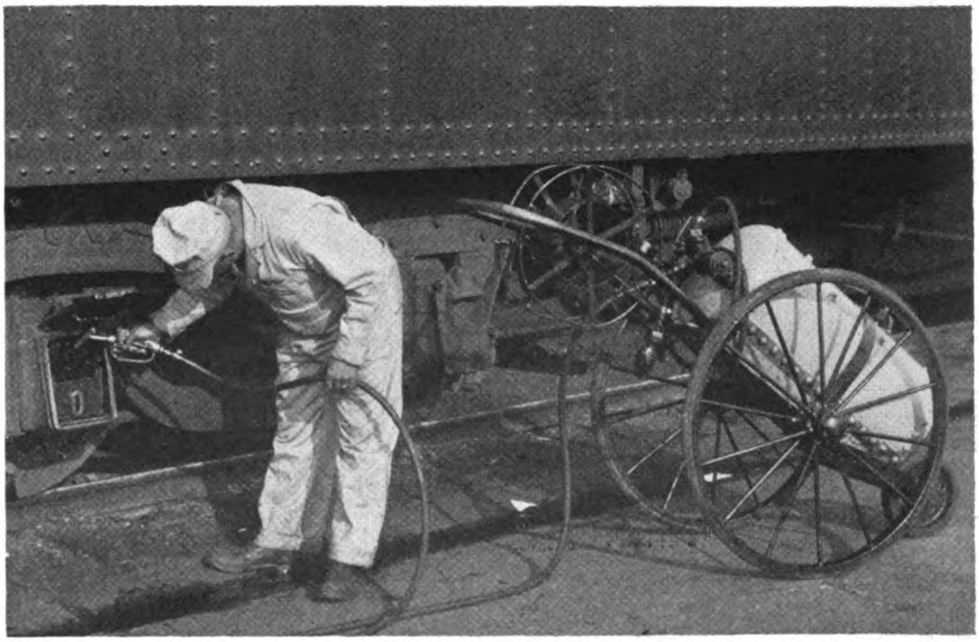


Fig. 4—Air-operated oil wagon used in lubricating car journals

used in servicing Waukesha air-conditioning units. Tanks are weighed empty and full on scales, built into the upper frame of the wagon, and conveyed from the supply depot to cars, and vice versa. This saves considerable time and expense and enables the railroad to keep an accurate record of the amount of propane gas consumed.

Portable air boosters, one of which is shown in Fig. 6, gives good results, taking air from yard lines and boosting it to standard pressure for testing high-speed brakes on individual cars or entire trains. They eliminate the necessity of installing stationary air compressors and can be moved from track to track. They consist primarily of a 9½-in. Westinghouse air pump, certified main reservoir, brake valve and gages, etc., mounted on four-wheel truck.

Fig. 8 shows a portable ice unloader used to handle 300-lb. cakes of ice at any location, which saves considerable labor in that it eliminates the necessity of ordering crews and spotting refrigerator cars at certain designated places, reduces the loss by melting, and prevents cakes from being broken up. The unloader can be lowered or raised to any height and is securely locked by side wings and clamps. Wagons used in conjunction with the unloader are built to carry eight 300-lb. cakes. Thus, much time is saved in supplying ice to air-conditioned cars. The illustration shows the counterbalanced, pivoted end of this unloader supporting a cake of ice and just ready to swing downward and drop the ice into a vertical position on a level with the ice wagon by releasing air pressure in the long 3-in. air cylinder.

In the reclamation plant, many items are being repaired and returned to service that were not previously attempted. For instance, broken pipe wrenches and monkey wrenches are being sent in; parts are removed from badly damaged ones to use on the others; teeth are resharpened and welding done where possible. Repaired wrenches are returned to store stock, thus minimizing the need for new wrenches.

Worn files are returned to this department and are

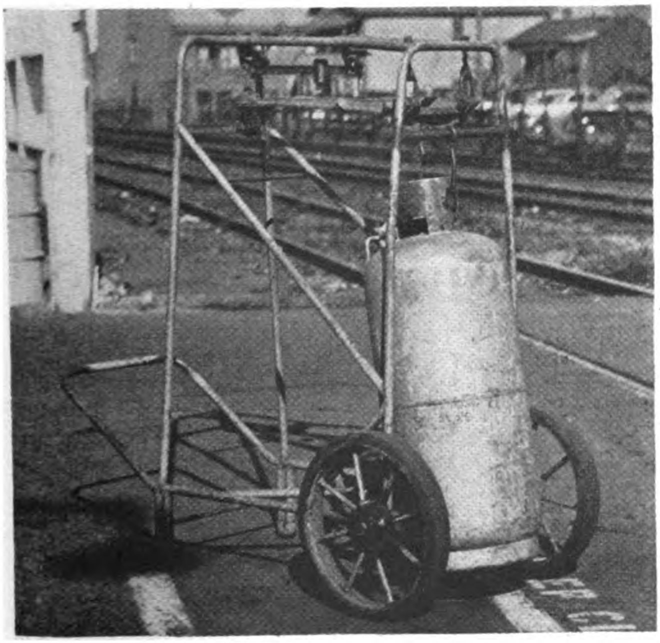


Fig. 5—A propane tank wagon equipped with scales for weighing tanks before and after being filled with gas

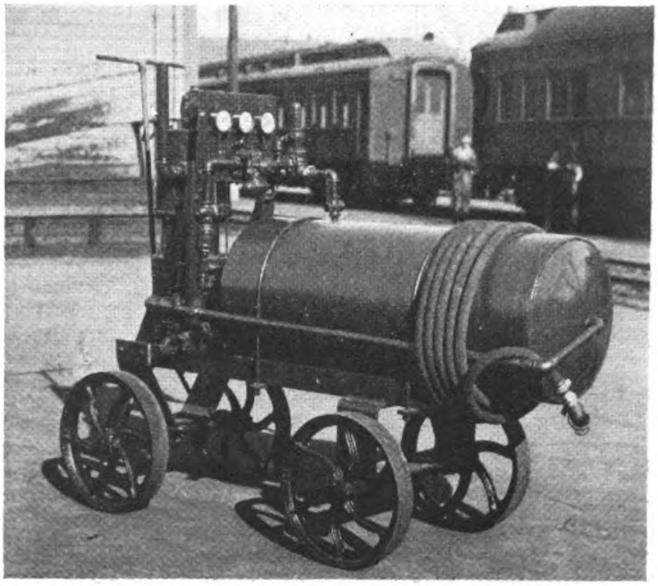


Fig. 6—Compact and convenient air booster used in testing high-speed brake equipment

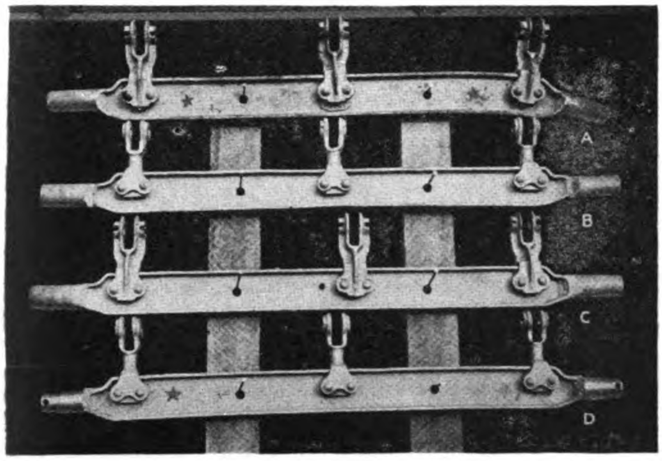


Fig. 7—Steps in the repair and reclamation of a clasp brake beam —(A) Tested at 42,000 lb.; (B) Veed for welding; (C) Welded; (D) Finished

reconditioned by heating in water then dipping in a 50-50 concentrated solution of sulphuric and nitric acids. Several dippings may be required depending on the condition of the file. Files are tested for sharpness and returned to store stock.

Train and signal hoses are brought in, cleaned, carefully examined, and tested, thus saving many hose that would have been scrapped ordinarily. Defective hose when possible are cut and spliced, in accordance with the method approved by the A.A.R. Similarly, pipe fittings, and A.A.R. valves, of which a large percentage formerly were scrapped when removed, are now being collected, cleaned, reconditioned and then returned to store stock.

In passenger car work nickel plating has been discontinued except for such items as signal equipment parts which are plated as a protection against corrosion. Silver plating, with satin finish, is applied on certain parts of "de luxe" passenger train cars where the use of paint is impractical.

For a number of years there has been difficulty in obtaining malleable-iron castings and in many instances the part could be cast in brass at about the same cost. This developed into the use of brass for items which would have been entirely satisfactory in malleable iron. These items are now being fabricated and welded, or cast in iron or steel.

Paints have been developed to replace aluminum and gold bronzes which have been satisfactory to date. Floor shellacs are now out of the question for railroad work and the railroad is testing out a shop-made substitute which has the quick drying features necessary for terminal repairs. Lacquers for pattern shop and molding are replacing shellac. The Southern Pacific has experimented with asphaltum as a substitute for the lead foil used when etching opal glass for drum-head signs, etc., on limited trains. Stencils for freight cars are now being made from U.S.S. No. 27 gage stove-pipe iron cut with nitric acid, instead of using zinc.

Furniture steel has been used in place of aluminum in modernizing passenger cars for such items as window capping, light extruders and various items of trimming. The steel is first cleaned, buffed and lacquered, and while not as workable as aluminum, it serves as a substitute.

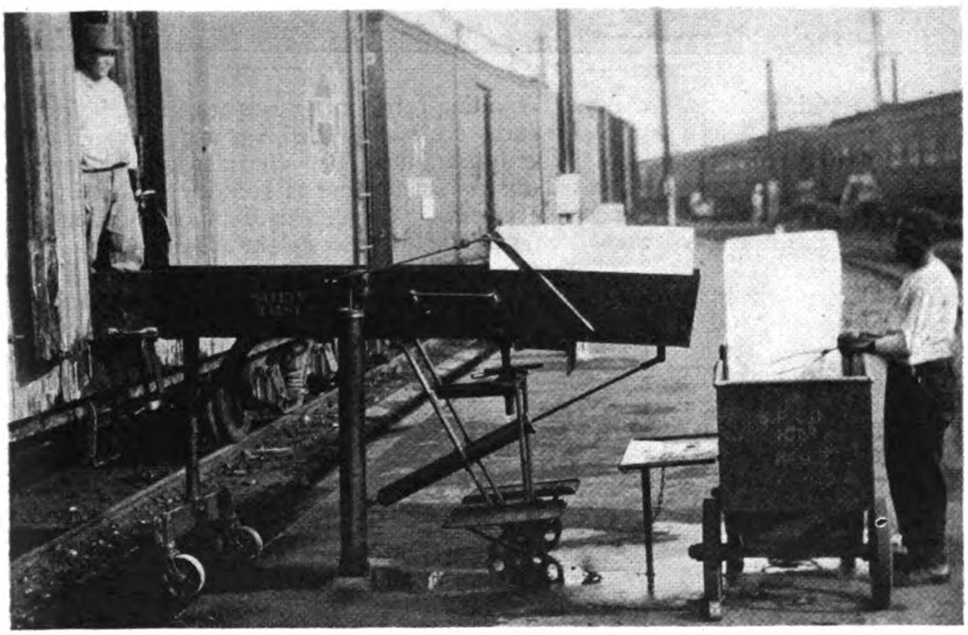


Fig. 8—Portable ice unloader ready to tip a cake of ice down to the wagon floor level

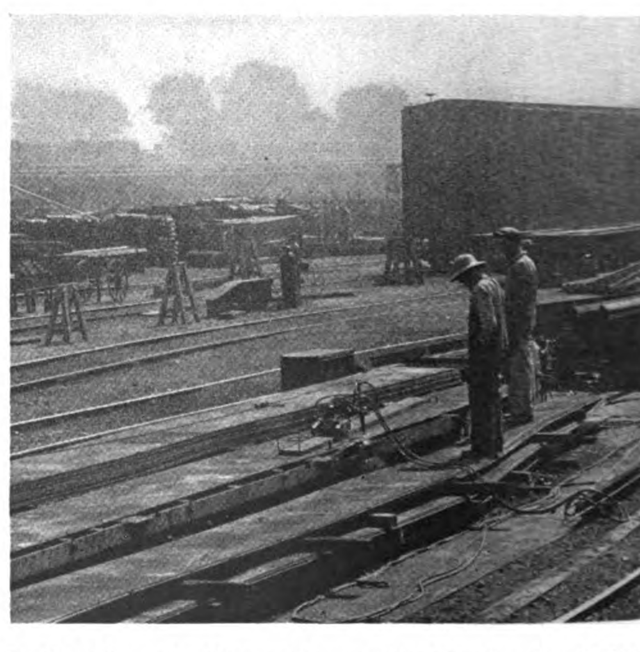


Fig. 9—Radiagraph cutting machine used for trimming side-sill plates to size

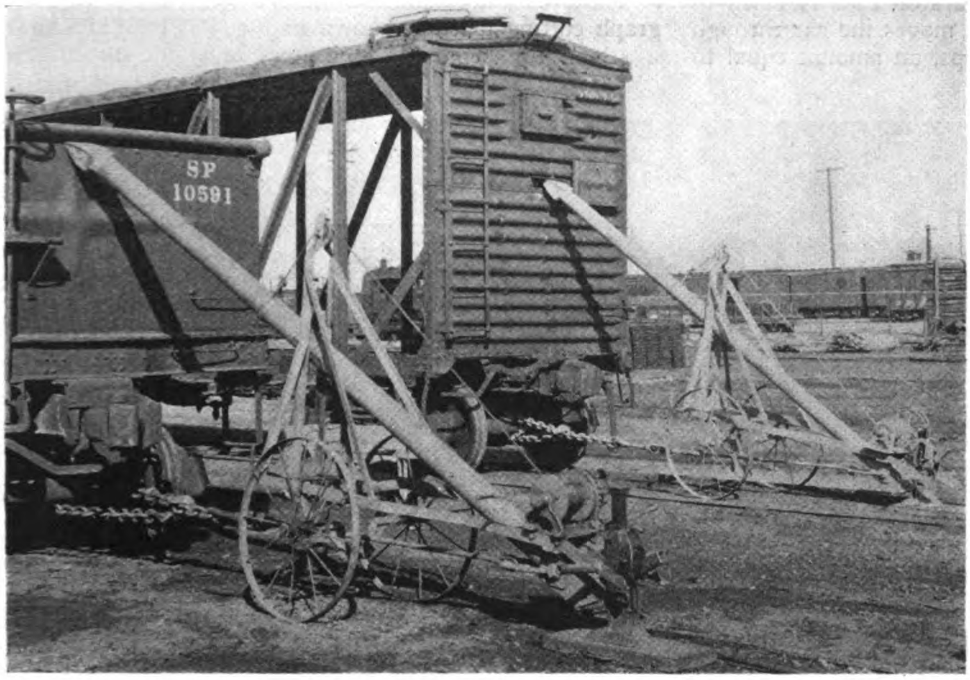


Fig. 10—Portable end straighteners used on gondola and box-car ends

The modernizing of passenger-carrying equipment has resulted in a considerable accumulation of old crimson and green plush. The best of it is used for repairs to other equipment, and the balance is being used in place of the restricted burlap for upholstery work, for protecting parts of machinery when shipping or storing, and similar uses.

Large parts of car equipment formerly made in cast steel are being fabricated and welded to make a better and more serviceable part. Body bolsters, side bearings, truck pedestals, center-bearing arches, center plates and similar parts are included. One item of repairs representing a considerable saving has been the simple clasp-brake beam which is being reclaimed from scrap by welding on new ends and machining them to size and contour. An illustration of this is given in Fig. 7.

A portable car-end straightener, two of which are shown in Fig. 10, is used to great advantage for repairing freight cars. It consists of a steel pole suspended on a frame about its center with the lower end pivoted from the frame. The center is raised and lowered to the desired position by a cable over the pulley shown, and connected to a spool with a ratchet and pawl, operated by hand. A lift jack is placed under the lower end of the pole and the pole pivot is connected to the car truck axle with a chain. The car end is heated where necessary and, as the jack is raised, the top end of the pole forces the car end into proper alinement.

In connection with the present program of new Southern Pacific 70-ton flat-car construction, the road has developed production jigs and fixtures which are of special interest.

Fig. 11 shows a punch press for punching rivet holes in center- and side-sill plates. The plate is guided

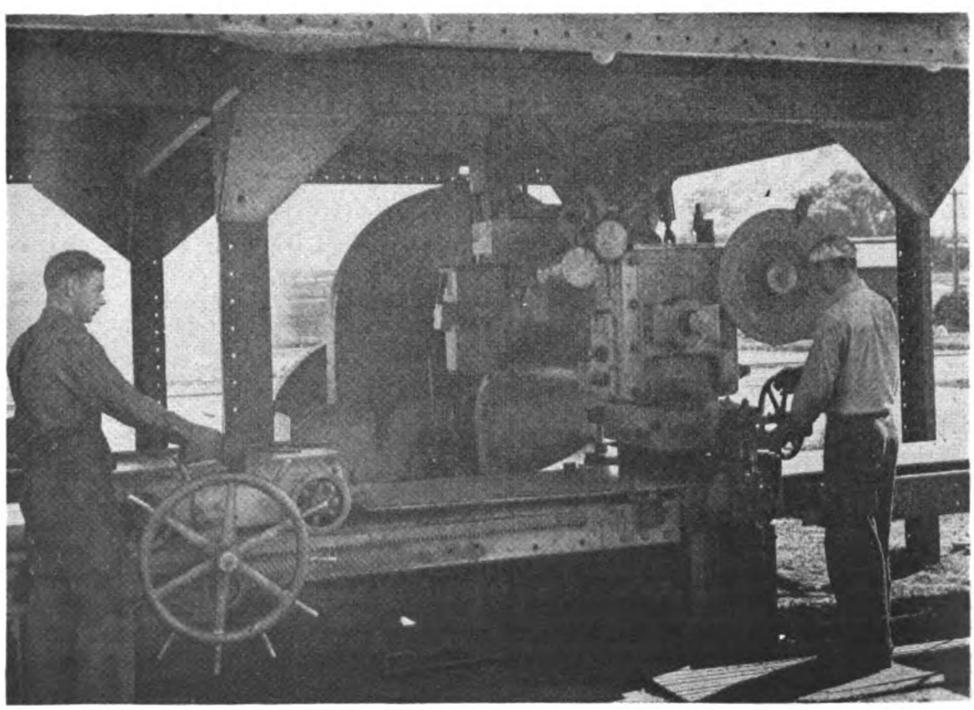


Fig. 11—Press for punching rivet holes in center- and side-sill plates

through the press by weighted cars on rails fastened to each end. The helper at the left moves the car through equal intervals by the use of stops, an amount equal to the lengthwise rivet pitch. The punch operator, by use of a dial indicator, operates the sliding head of the press to make the required crosswise spacing and to punch the required size of hole. Each time the helper moves back one interval, the operator moves the dial one position which indicates the required punching for that interval. Thus, after passing through the press, all necessary rivet holes have been punched and the plate is ready for trimming and fitting up.

The plates are next trimmed to size using a radiagraph cutting machine shown in Fig. 9. Fig. 12 shows a set-up for bending the center- and side-sill angles. Here the angles, having been punched, are bent to a template. The angle templates are used on the last car.

Jigs for fitting up and riveting center and side sills consist of posts mounted in concrete foundations. Each post is mounted with a pivot and lock arrangement to which the sills are fastened. Thus, the sills are supported in a horizontal position for fitting up and reaming, then swung into an inclined position, shown in Fig. 13, for riveting.

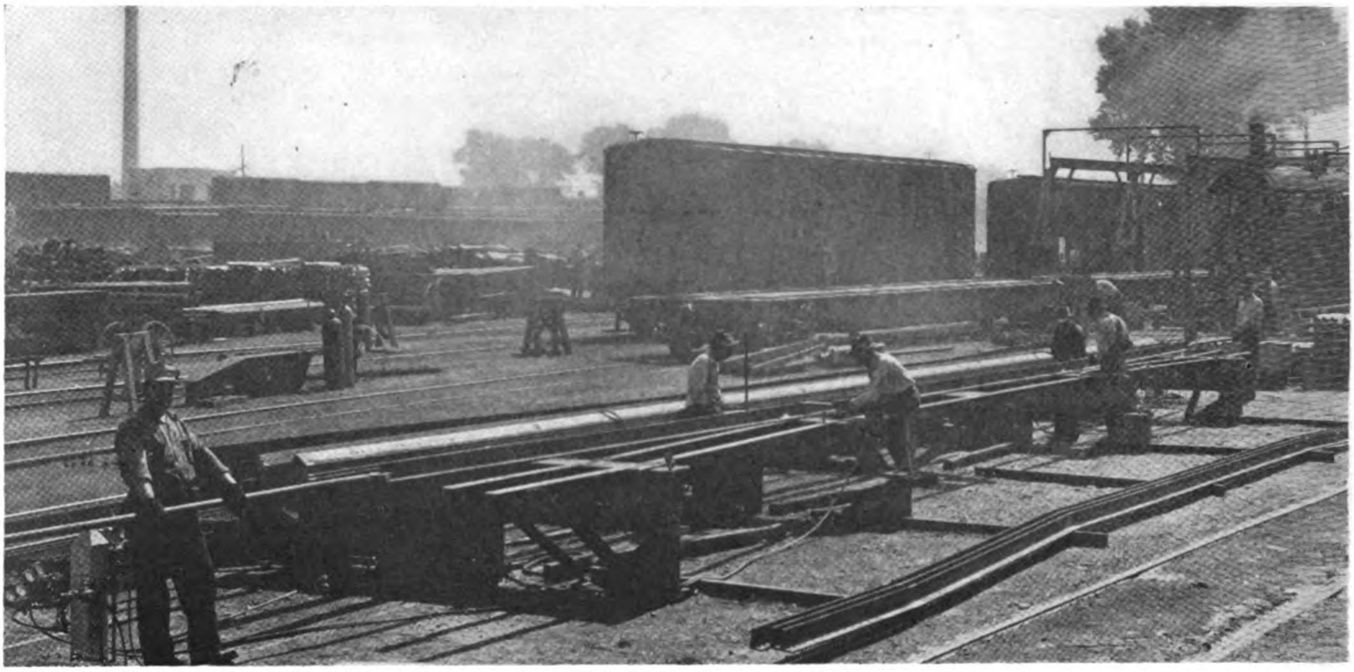


Fig. 12—Jig for bending center and side-sill angles

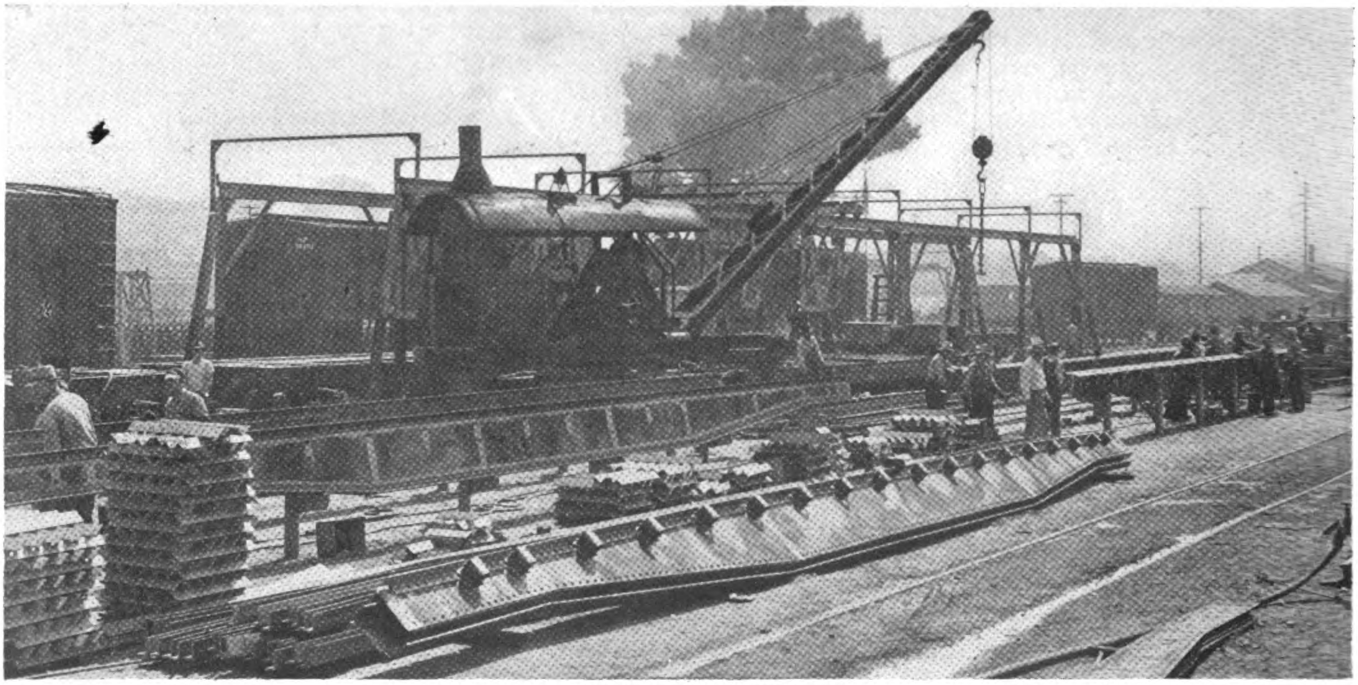


Fig. 13—Car sills are swung into an inclined position for greater convenience in riveting

Instructions for Servicing AB Self-Oiler Pistons

The A. A. R., Mechanical Division, Committee on Brakes and Brake Committee has recently prepared the following complete instructions for servicing the self-oiler type of pistons used in AB freight brake equipment:

The piston, slide valve, graduating valve and bushings must be thoroughly cleaned so as to remove all dirt, oil, gum or grease. Benzene, gasoline or other approved cleaning fluids can be used for this purpose.

The piston packing ring and its groove should be cleaned without removing the ring from the piston groove. This can be done by dipping the piston into cleaning fluid and then moving the ring around in the groove (for an early vintage of self-oiling piston which has two drilled holes in the piston head near the top of the piston, see Appendix A). This operation should be repeated until the groove and ring are thoroughly cleaned, after which the excess cleaning fluid can be blown away or dried by using an air jet.

Where rings are stuck with dirt too tightly to be moved in the groove it may be necessary to soak the ring in penetrating oil and then tap the ring gently with a hard wood block. For this purpose a maple or hickory wooden block about 1 in. by 1 in. by 4 in. (with square ends) should be used to tap the ring so as to drive it flush with the top edge of the groove. This tapping should start at one side of the ring joint and progress around the piston in short steps until the ring is loosened sufficiently to be moved in the groove. If this procedure will not loosen the ring it is evidence that the groove is binding, in which case the groove must be reconditioned and a new ring fitted.

If the wick which runs from the small crescent shaped recess in the bottom of the ring groove to the oil reservoir wound in a counter-clockwise direction around the oil reservoir. The free end of the wick should not obstruct or come in contact with the $\frac{1}{32}$ in. diameter breather hole located adjacent to the wick hole in the oil reservoir.

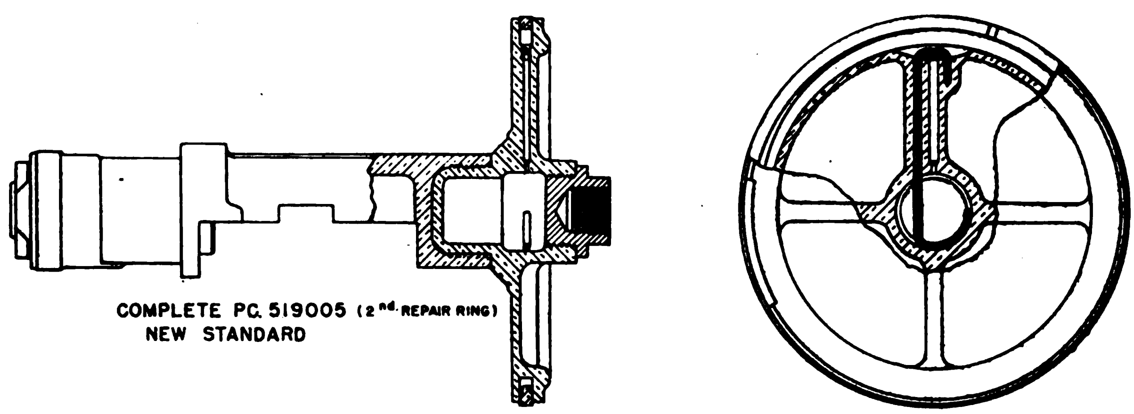
When the packing ring and its groove are thoroughly cleaned and dried the end of the ring should be positioned above the lubricating hole in the bottom of the ring groove at the top of the self-oiling piston. Raise the end of the ring and see that the lubricating wick is flat on the bottom of the recessed portion of the ring groove. The wick should touch neither the ring nor the mouth of the breather hole.

The threaded cap nut which seals the oil reservoir in the self-oiling piston head must be removed to refill the oil reservoir. Before removing, insert a cap screw or its equivalent into the outer tapped opening so it will not be distorted by the wrench when being removed. The stem back of the piston head is drilled for a spanner wrench to facilitate holding the piston.

Hold the piston head in a horizontal position with the stem down and note that the wick leading from the ring groove winds in a counter-clockwise direction around the wall of the oil reservoir. The free end of the wick should not obstruct or come in contact with the $\frac{1}{32}$-in. breather hole located adjacent to the wick hole in the oil reservoir. Fill the oil reservoir with an approved triple valve oil until the oil is level with the bottom of the threads located in the center of the piston head. Start the cap nut a few threads and then hold the piston head in a vertical position. The stem back of the piston head should be held firmly with a spanner wrench and the cap nut, with cap screw still in place, pulled tight. Remove the cap screw from cap nut.

The face of the graduating valve, the upper surface of the slide valve (which is the graduating valve seat), the slide valve face, the slide valve seat and the upper portion of the bushing (slide valve spring bearing) must be

Self-oiling feature used in both the service and emergency pistons of AB freight brake valves



in self-oiling type pistons is damaged from any cause, such as reconditioning the groove, etc., it must be replaced. A new wick is approximately 5¾ in. long and to facilitate assembly a special wick is available having bare wire on one end for about 2¼ in. If specially prepared wicks are not available the wire may be bared by burning. The bare wire can be easily started down through the wick hole and the wick pulled through the hole, until about ½ in. end is left in the ring groove. The end of the wick in the ring groove is then bent across the middle of breather hole and anchored in the last hole in the recessed section at the bottom of the ring groove. The bare wire should then be cut off the wick and the wick

glazed with the best grade of very fine pure dry air brake graphite.

To apply the graphite, it will be found convenient to use a small wooden paddle about 8 in. long having a small piece of chamois skin glued to the paddle end. The width of this paddle must be somewhat less than the width of the slide valve seat in the bushing. Place a small quantity of the graphite on the chamois skin and rub the surfaces specified until they show a dark copper color. There must be no free graphite allowed to remain on the valves or seats and they must be free from any oil or grease before the graphite is applied.

Before the cleaned piston is replaced in the piston

bushing the side of the packing ring opposite the scarf should be pressed to the bottom of its groove and three drops of approved triple valve oil put in the groove through the ring scarf opening. Then restore the ring to its normal position and carefully rotate it in the groove to distribute the oil. Position the ring scarf at approximately one o'clock when facing the piston head. Next, place three drops of the triple valve oil in the clean, dry bushing and distribute it over the entire surface in a manner to avoid introducing dirt or grit. Then insert the piston and slide valve in the body, leaving them in release position, after which place three additional drops of triple valve oil in the cylinder bushing and again distribute it on the bushing surface as previously described.

Appendix A

An early vintage of self-oiling piston, having two holes drilled in the piston bead near the top of the piston, must not be submerged in cleaning fluid. To clean the packing ring and its groove squirt the cleaning fluid around the ring and then move the ring around in its groove, this operation being repeated until the groove and ring are thoroughly cleaned, after which the excess cleaning fluid can be blown away or dried, using an air jet.

If for any reason it is necessary to remove the ring from the piston, the wick in the bottom of the ring groove should be removed and it need not be replaced when a new ring is applied.

The same procedure for filling the oil reservoir should be followed for other types of self-oiling pistons. This type of piston does not have a spanner wrench hole in the stem back of the piston head so that when removing or applying the oil reservoir cup nut it will be necessary to hold the piston by the squared portion of the stem adjacent to the piston head. It will be noticed that the oil reservoir is packed with gauze. Be sure that the gauze pack is thoroughly saturated and that the oil level does not recede from the bottom of the threads.

Air Brake Questions and Answers

HSC High-Speed Passenger Brake Equipment

69—*Q.—What insures the return of the self-lapping portion to release position?* A.—The relay portion spring *42* overcomes the resistance of the diaphragm stack, affording a positive release of low brake cylinder pressures.

70—*Q.—Is this release force effective at all times?* A.—No; only with a low valve application pressure.

71—*Q.—What is the maximum application pressure for the release force to be effective?* A.—Seven pounds above this amount the release force is nullified.

72—*Q.—Why was this limit decided upon?* A.—In order to provide a true ratio of brake cylinder pressure to straight-air pipe pressure for all applications above this value.

73—*Q.—How is this done?* A.—This is done by the inshot valve which, at the start of an application permits *direct flow to all diaphragm chambers* until 7 lb. is obtained.

74—*Q.—What does the 7 lb. pressure accomplish?* A.—It overcomes the resistance of the release spring and operates the relay portion to provide a low brake cylinder pressure, sufficient to overcome brake rigging resistance and apply the shoes to the wheels.

75—*Q.—What happens then?* A.—The inshot valve port cuts off the direct flow of air to all diaphragm chambers except that of the controlling diaphragm.

76—*Q.—What does the inshot valve portion consist of?* (*See Section A-A, Fig. 5*) A.—A diaphragm *85*, supported between the body and bracket castings, to which is assembled a piston *84*, a supply valve *92* with its spring *94*, exhaust valve *93*, with its spring *94*.

77—*Q.—What is the normal position of the piston?* A.—The spring normally holds the piston and diaphragm against the stem of the supply valve which is held unseated against the tension of its spring.

78—*Q.—What flow of air results?* A.—Permits flow of air to the diaphragm stack.

79—*Q.—When is this flow of air cut off?* A.—A 7-lb. pressure compresses the spring, deflecting the diaphragm sufficiently to permit the spring to seat the supply valve, cutting off communication to the diaphragm stack.

80—*Q.—What is the normal position of the exhaust valve?* A.—It is normally seated by its spring.

81—*Q.—When is the exhaust valve unseated?* A.—When inshot pressure exceeds 7 lb., the diaphragm *85* will be deflected further, moving the piston *84* to engage the stem and unseat the exhaust valve.

82—*Q.—What results from this movement?* A.—This movement opens a passage way for the exhaust of the air between the diaphragms of the stack to the strainer protected exhaust *82*. If the relay valve is furnished with magnets the exhaust air will flow through the magnet check valves before reaching the strainer.

83—*Q.—When does the diaphragm return to its cut-off position (retaining 7 lb. inshot pressure)?* A.—After excess pressure is removed.

84—*Q.—What protects the valve from dirt, etc.?* A.—A strainer *17* (See Section C-C, Fig. 5) in the pipe bracket, protects the valves as air from the displacement reservoir or straight-air pipe passes through it.

85—*Q.—What does the magnet bracket include?* A. Three magnets; high speed (H. S.), medium speed (M. S.) and low speed (L. S.).

86—*Q.—How are the magnets wired?* A.—The coil of each magnet is wired to terminal blocks *123* and *145* (Fig. 5) with plug connections to the speed governor relay cabinet. (Fig. 16.)

87—*Q.—What does the magnet control?* A.—Each magnet has an armature stem *154* (Fig. 5) which controls the position of the double-beat magnet valve *161* as the coils are energized or de-energized in accordance with the train speed.

88—*Q.—How do the magnet valves function?* A.—They are operated to establish connection from the displacement reservoir or straight air pipe to one of the diaphragms (*38, 68, 64* or *60*).

89—*Q.—As previously stated, the area of the three diaphragms, as related to the main diaphragm, is 80, 60 and 40 per cent. What is the object of this variation?* A.—Each diaphragm is in control at certain train speeds.

90—*Q.—At what speed is the main diaphragm in control and what results from this control?* A.—This diaphragm is in control at speeds exceeding approximately 65 m. p. h. and the self lapping portion reproduces brake cylinder pressure equivalent to straight air pipe pressure.

91—*Q.—When is the 80 per cent diaphragm in control.* A.—Between speeds of approximately 65 and 40 m. p. h.

92—*Q.—What results from control by this diaphragm?* A.—Only 80 per cent of the straight air pipe or displacement reservoir pressure is reproduced in the brake cylinder.

93—*Q.—At what speed is the 60 per cent diaphragm*

in control? A.—Approximately between 40 and 20 m. p. h.

94—*Q.—At what speed is the 40 per cent diaphragm in control?* A.—At speeds below 20 m. p. h.

95—*Q.—Are the results similar to the 80 per cent diaphragm when the 60 and 40 per cent diaphragms are in control?* A.—Yes, the percentage of straight air pipe or displacement reservoir pressure reproduced in the brake cylinder coincides with the particular diaphragm in control.

96—*Q.—What serves to conserve battery current when the brakes are released?* A.—A K-3 switch portion (Fig. 11).

97—*Q.—Where is it applied?* A.—To the pipe bracket of the FS 1864 relay valve and wired in the battery circuit to the magnet valves.

Better Fits for Brake Shoes

According to a circular letter recently issued to the members of the A.A.R., Mechanical Division, the committee on Brakes and Brake Equipment reports that an inspection of over 34,000 brake beams disclosed approximately 50 per cent of all removals due to worn heads. The worn head condition is a direct result of relative motion between the brake shoe and the brake head, the better the fit between these two parts being, the less they move with respect to each other and consequently minimize wear.

The Mechanical Division manual on Standard and Recommended Factors shows the dimensions of standard gages used in gaging brake heads and brake shoes, and in order to conserve material as much as possible and extend the life of brake beams, the committee recommends that sufficient heads and shoes be gaged as received from the source of supply to insure that they meet the limits imposed by the gages.

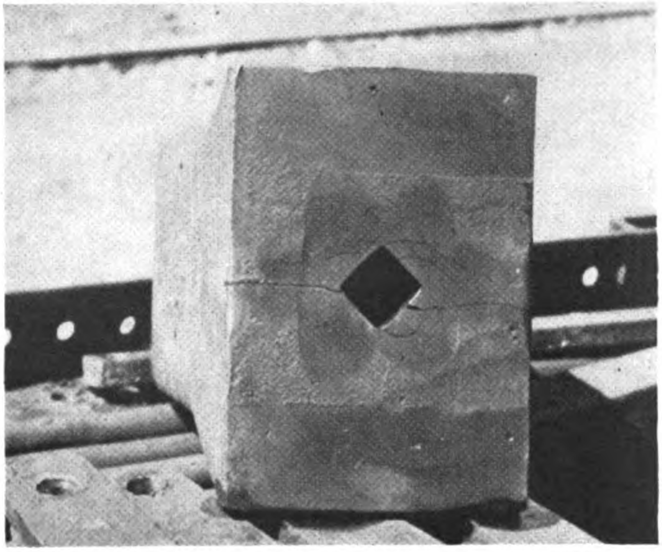
More Draft Gear Bearing Area Needed

By W. C. Fox

The A. A. R. Committee on Couplers and Draft Gears at the 1937 meeting recommended that the draft gear bearing area be increased 67.5 per cent on the vertical cast steel yoke, Grade B steel. It was also proposed to reduce the wedging effect of the bearing area by decreasing the taper of the contact surface. The report mentioned above (Circular No. D. V.-917), was signed by seven of the leading railroad men in the mechanical field, but I do not believe it was accepted. It was pointed out that the increased bearing area would strengthen the yoke and would not sacrifice any desirable feature.

Just recently I had occasion to inspect a yoke which was removed from a car. The yoke was practically new, having a casting date of 12-41, and I noticed that it had a draft gear bearing area of about 23 sq. in. and had the ⅛-in. taper which the committee decided was too sharp. If the change in design had been made, the yoke would have had a bearing area of 38.75 sq. in. The illustration shows a gear barrel which is split across the base and up both sides. If the gear casing is not broken, a depression is formed in the base by the pulling surface of the yoke which shortens the gear and causes unnecessary slack.

When a new gear is applied with a yoke of this kind, it will be noticed that the pulling surface of the yoke on the gear is only about 5 sq. in. and, as the slack is taken up on a train of cars, the yoke hits the gear base directly in the center where it is the weakest on a number of our standard makes, and the constant hammering soon shatters the metal. If the proposed change in the design of the coupler yoke had been made at that time, and it could have been made very easily, I believe it would have saved the car owners thousands of dollars.



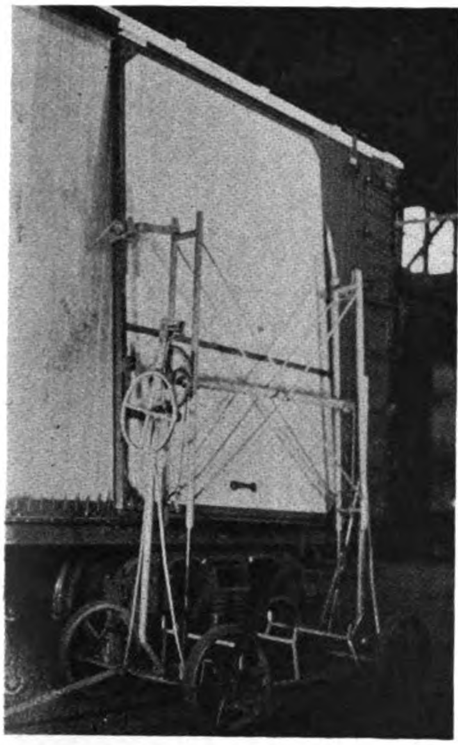
Draft gear barrel split across the base and up both sides owing to limited bearing area

Why Have So Much Space Between Shoulders of Rear Draft Lugs and Coupler Yoke?

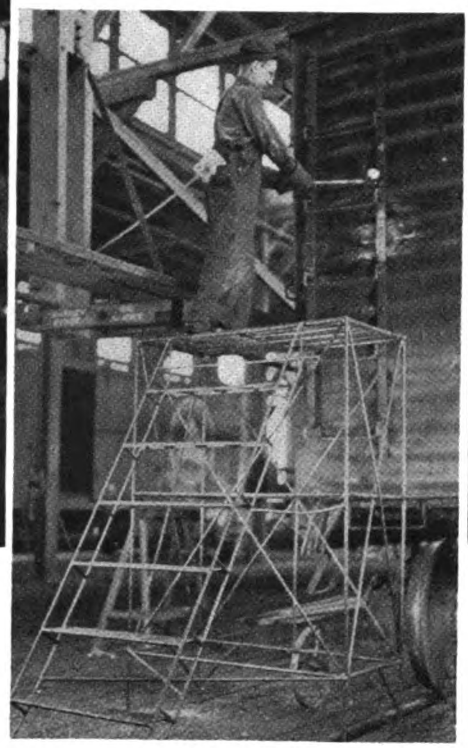
If a train of freight cars were pulled on the highway where there were no rails to guide them it would be found that some of the cars would run to one side of the road and some to the other side. This would increase the draft of the train and is caused by cars not being pulled from the center. Shoulders on rear draft lugs are so far apart that the vertical coupler yoke can be as much as 14 per cent off center on the draft gear. It is natural for the yoke to slip to the weaker side of the gear and to stay there. When gears are removed it is often found that one side of the gear is badly worn and that the other side is hardly worn at all.

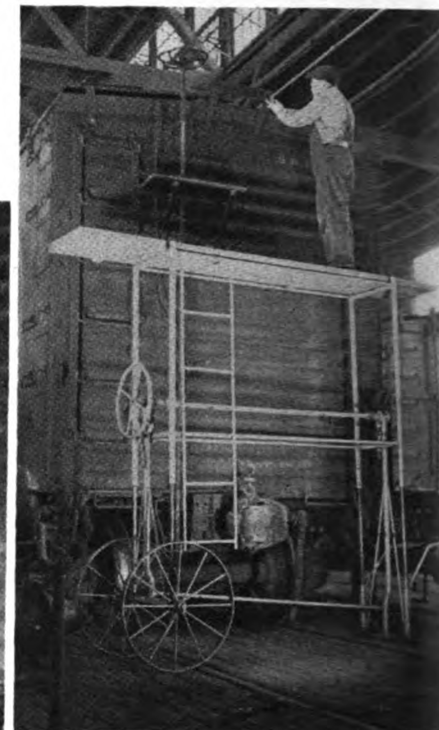
This habit or tendency of the yoke to slip to one side of the gear and to pull from there is as prevalent with the newer type swivel butt coupler and corresponding yoke as it is with the older, more rigid yoke and coupler. This side slipping of the rear end of the yoke on the gear is increased on the older type of vertical yoke by the fact that it is almost impossible to find a yoke on which the front key slot wearing surfaces are square with the body of the yoke on account of uneven wear or unequal shimming.

A car that is not pulled from the center will cause unnecessary wear on the wheel flanges and rails and will not roll as easily as one pulled directly from the center. Cars with cushion underframes and cars with Farlow yoke attachments naturally would not be classed with cars mentioned above.



A light, portable platform, built of welded tubular steel, convenient for working on the ends of box cars





A side-door hanging device—The door is loaded in the cradle which is then elevated by the gear winch

A portable air - operated electric floodlight unit for use where ordinary electric lights are not available—It is especially useful for emergency night repairs on the rip track—Adjustable floodlight standards also are availab'e for use on interior car work

Great Northern Car Shop Devices

A portable adjustable staging for working on the sides or ends of cars—Its height can be adjusted by means of the hand winch — Vertical movement of the platform is guided by the telescoping standards at the four corners

Tubular construction, as in many other portable platforms and stagings, is also used in this light, rigid hand ladder

A light, strong, easily portable staging for car stenciling, made of welded pipe, with two wheels under one end and legs and drop handles at the other end—Hoops and brackets hold a complete outfit of stencils, stencils guns, hose, etc.

(*Turn to next left-hand page*)

High Spots in

Railway Affairs . . .

Railroads Highly Complimented

From the time the United States entered the war until the end of July the railroads carried in organized movements about six and a quarter million troops. In commenting on this Brigadier General Charles P. Gross, chief of the Transportation Corps of the Army's Service of Supply said: "In the war effort, no group, no agency, works more wholeheartedly, more energetically to fulfill the war mission than do the railroads and their national organization, the Association of American Railroads. Their team play has been superb. They respond to the War Department immediately and to their full capacity. My relationship with them has been one of the most heartening experiences I have had. The railroads have the spirit that will win the war."

Pensioners Called Back

The Employment Service of the Railroad Retirement Board, at the request of former railroad workers desirous of assisting in the war-time emergency, is undertaking to return annuitants and pensioners to railroad service. If these men are physically fit and want to return to service, the Board will try to place them, or in case railway employment cannot be found, will refer them to the United States Employment Service for possible placement in other critical industries. The Railroad Retirement Act of 1937 will prevent those receiving annuities to do so in any one month they work for a railroad. An effort will therefore be made to so arrange the beginning and ending dates of resumed service so that they will not receive less in any one month than if they had remained on the annuity roll for that month. Pensioners — those who were transferred from private railroad pension rolls to the pension rolls of the Railroad Retirement Board—will continue to receive their pensions while they are employed.

Ayres on Railroad Freight Capacity

Brigadier General Leonard P. Ayres, who recently retired as chief of the statistical branch of the U. S. Army, is vice-president of the Cleveland Trust Company and is widely known as a sound economist. He points out in an article in the Business Bulletin of the Cleveland Trust Company that: "Our railroads are doing an outstandingly good job of war-time transportation. Probably they can just about succeed in carrying the peak volumes of autumn freight in September and October without any serious car shortages. Nevertheless it ought not to be assumed that they can indefinitely continue to transport volumes of freight that increase steadily and unceasingly from month to month. The limits of their capacity have been nearly reached, and when they are reached the volume of our industrial output will have to level off no matter what other forms of transportation may be called into service, and no matter how large the war appropriations may be." Included in General Ayres' article is a graph that presents the statistical background for this warning statement. Using the average figures for the year 1939 as a base, represented as 100 on a comparative scale, the diagram shows that the number of ton-miles of freight carried by the railroads each month since then has grown steadily—making due allowance for seasonal variations and such exceptional conditions as strikes affecting coal shipments—until in the middle of this year it reached a point about 175 on the scale without showing any tendency to level off. In the same period the number of freight cars on the railroads has remained relatively uniform, increasing from the base value of 100 only to approximately 105, while the number of locomotives has decreased from the base point of 100 to less than 95.

Eastman on the Material Situation

In discussing the railway material situation in an article in the Railway Age, Director Joseph B. Eastman of ODT, made this significant statement: "It is my conviction, therefore, that for the successful prosecution of the war, in which transportation plays so great a part, it is essential, first, that the railroads be provided with an adequate supply of the materials necessary to keep present equipment and facilities in good running order, continually and without interruption, and second, that they be provided, not with an abundance, but with a moderate and modest supply of new locomotives and cars. True, the steel which will go into the railroad industry under such a program cannot then be used for armaments, but it is essential, not only to the production but to the use of the armaments, that there be no break-down or let-up in the constant and efficient functioning of transportation. Nor will such a program render unnecessary in any degree unremitting attention to the maximum utilization of the transportation facilities that we have. The thing which gives me the greatest satisfaction is that I am confident that the railroad industry has full realization of this need and is bound that it will at all costs do its part in winning the war. The spirit and morale of the industry have never been better."

Railroads Need New Equipment

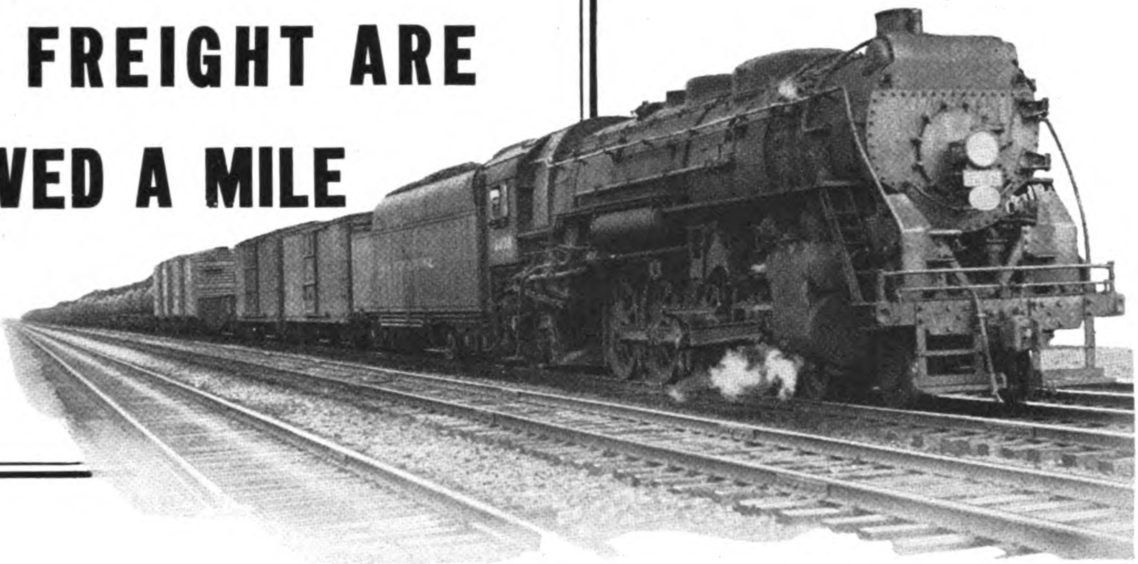
General Charles P. Gross, chief of the Transportation Corps of the Army's Service of Supply, recently participated in a radio round-table discussion in Washington. He pointed out that if the steel required for the war is to be obtained the railroads must be allowed the equipment necessary to move the things that produce this critical material. "The railroads need steel," General Gross said. "Every war agency seems to require more than it is getting. But in order to make one ton of steel, the railroads must haul five tons of ore, coal, coke, limestone and the other essentials for its manufacture. To get the steel, the railroads must be able to play their essential part. They must be geared to the full, all-out war effort of this nation as a vital element of the team. The railroads have met the startling increases in traffic since 1939 largely by using their reserves rather than by additions to their equipment. They have used existing equipment more intensively with increasing cooperation between companies. They have reduced their unserviceable units and brought them into use. They have loaded cars more completely. This reserve capacity in heavier loading, in blocking through solid trains and in unification of effort is not exhausted, but there is far less fat left. The additional loads that are coming in 1943 must, therefore, be met to a greater degree by new equipment."

Grade Crossing Accidents

A tremendous effort is being put forth by the National Safety Council to reduce accidents because of the serious effect they have on slowing down our war efforts. The railroads have contributed generously to the funds being raised to promote this campaign. One phase of the problem which seriously effects their efficiency and effectiveness is grade crossing accidents. The railroads have consistently done what they could to eliminate such accidents, but the public generally and public authorities have not cooperated to the extent that they should. President Jeffers of the Union Pacific has appealed to the governors of states served by his railroad to take action. As a result several of them have issued proclamations calling upon motorists to stop vehicles before crossing railroad tracks. These proclamations point out that accidents at crossings have caused serious delays and damage to vitally needed war equipment and have endangered the lives of persons and troops being carried. In too many instances the drivers fail to observe warnings and crash into the sides of trains.

(Turn to next left-hand page)

A MILLION TONS OF FREIGHT ARE MOVED A MILE



. . . each minute of the day and night!

That's one measure of the railroads' present contribution to the national war effort—a fighting force of the first importance.

In the words of Mr. John J. Pelley, President, Association of American Railroads, "The railroad freight car is truly a weapon of war because it is the freight car, together with the locomotive which pulls it and the track on which it runs, that make possible all the other instruments of war. Without them, the whole war effort would collapse."

Lima-built Modern Super Steam Power Locomotives are serving the railroads from coast to coast in their gigantic task, helping them to make and to break all records in gross-ton-miles per train-hour.

LIMA LOCOMOTIVE WORKS — LIMA LOCOMOTIVE WORKS INCORPORATED — INCORPORATED, LIMA, OHIO

NEWS

Industrial Freight Cars Placed Under Limitation Order

GENERAL Limitation Order L-97-b, taking control of the production and delivery of industrial cars was issued on August 8 by the War Production Board. Industrial cars are defined as "cars of the railroad type (including cane cars) which are used in intra-plant service."

Railroad Shops Contribute to War Production

SEVERAL roads are now cooperating in the nation-wide program for using railroad shops for war production to which they are adapted. Among these are the following:

Baltimore & Ohio.—Repair shops on July 15 began producing crosshead guides and guide plates from rough iron castings for the vertical triple-expansion marine engines used in the Liberty cargo ships under construction in Baltimore shipyards. This work, sandwiched between regular railroad repair and production jobs, is done by the employees under their regular wage-and-hour agreements with the railroad, and the company's sub-contract is on a non-profit basis. B. & O. shops also have undertaken repair work on locomotives, cranes, and other equipment owned by industries engaged in war work.

New York Central System.—The New York Central System has received an initial order for a special type of marine equipment to be produced in its own shops. For some time past the railroad has been exploring its shop capacity to develop the extent to which it might be employed in aiding the production of armaments. As a result, negotiations are now under way contemplating the manufacture of a wide variety of articles required in the war program—forging gun barrels, anchor shanks and shackles; the machining of parts for combat tanks; the manufacture of forgings for marine engines; and spot welding aluminum plates.

"Two of the Central's shops in the midwest," said F. E. Williamson, president, "have been turned over completely to the War Department. One of these is now being used for training men of one of the Engineer Railway Shop Battalions recently called into service, which includes among its officer personnel some of the Central's best shop experts.

"The second shop in the midwest has become an important depot for combat tanks. Through this shop large numbers of tanks, manufactured at various plants within the surrounding area, are channeled for final check just before they are sent on their way into service. A third shop in the East has been made available for the manufacture of reciprocating steam engines for Liberty cargo ships for the Maritime Commission."

Pennsylvania.—War production activities in Pennsylvania shops began about the middle of May, and have already reached large proportions. Work now going on includes machining ordnance parts; casting cylinders for 2,500-hp. triple-expansion marine engines for the merchant fleet; machining rolling mill rolls to be used in the production of ammunition cases; and machining frames for the trimming presses used in war industries to shear off the "flashings," or rough projecting edges, from drop forgings.

Other jobs in prospect for this road's shops include machining tank parts; machining and finishing air compressor cylinders for submarines; and building "hot metal" cars for steel mills, used chiefly in carrying hot slag to dumps, but also employed in transporting molten metal from one place to another in steel plants.

Readjustments Have Released 114 Locomotives, 533 Passenger Cars

VOLUNTARY revisions in passenger schedules, services and equipment assignments during the first six months of 1942 by the principal passenger-carrying railroads have resulted in the release of 114 locomotives and 533 passenger-train cars for the needs of war traffic, according to the Office of Defense Transportation. A daily saving during the six months period of 24,700 passenger train-miles, and 176,000 passenger car-miles as the result of the revisions also was announced.

1941 Freight Commodity Statistics

TONS of revenue freight originated by Class I railroads in 1941 showed an increase of 21.6 per cent over 1941, according to the Freight Commodity Statistics issued by the Interstate Commerce Commission's Bureau of Statistics. Last year's total was 1,227,675,897 tons as compared with 1,009,-420,663 tons in 1939.

The 1941 totals by commodity groups and the percentage increases over 1940 are as follows: Products of agriculture, 100,-172,666 tons, 12.8 per cent; animals and products, 16,810,149 tons, 8.8 per cent; products of mines, 684,433,639 tons, 20 per cent; products of forests, 71,536,304 tons, 22.9 per cent; manufactures and miscellaneous, 336,623,134 tons, 28.5 per cent; all l. c. l. freight, 18,091,005 tons, 23.1 per cent.

The statement also sets forth freight revenue by commodities; and there again all groups showed increases over 1940, the range being from the 8.5 per cent rise in the revenue from animals and products to 36 per cent for manufactures and miscellaneous. The total 1941 freight revenues are shown in the statement as $4,624,819,565, up 25.7 per cent from 1940's $3,678,097,359.

American Welding Society to Hold Convention in Cleveland

THE twenty-third annual meeting of the American Welding Society will be held from October 12 to 15, inclusive, at the Hotel Cleveland, Cleveland, Ohio. Although the program as outlined accents the importance of welding under the present war-production demands, many of the papers will be of general interest. Fifty-seven papers are scheduled for presentation covering the training of welding operators, fatigue and impact testing of welds, weldability of steels, flame cutting and non-destructive testing and inspection of welds. Other developments in all fields of production welding will be covered.

"Rubber" Box Car for Hauling Oil

A NEW type of box car—lined with synthetic rubber—made its initial appearance in Washington, D. C., during the week ended August 22, and government officials are hopeful that it may be used as a part of the solution of the problem of transporting petroleum to the east coast shortage area. Filled with six cells made of "Mareng," which is fabricated from a synthetic rubber known as "Thiokol," the car was brought to Washington for inspection by Joseph B. Eastman, director of defense transportation, and other high government transportation officials.

A statement from the Glenn L. Martin Company, Baltimore aircraft builders, who developed the Mareng cell, said that the car will be placed in service immediately transporting oils, but that the nature of the tests to which it will be subjected will be determined by the Association of American Railroads, whose representatives will have an opportunity to observe it under actual operating conditions. It is also understood that the Bureau of Explosives will take part in the tests, and the car must meet the approval of the Interstate Commerce Commission.

A 50-ton box car is being used for the first installation of the Mareng cell. It contains six of the cells, which, when filled, resemble huge packing cases. The oil is loaded through a pipe in the top of the car which feeds all the containers. A single discharge valve in the bottom of the car unloads it. The cells are collapsible, and when not in use, can be rolled up. It was suggested that future studies might develop means to get two-way use out of the box cars by stacking the cells in the car when the oil is unloaded and using it for other freight on the return trip.

Each of the cells has 2,500 gallons' capacity. Only two cells of the test unit were filled with oil on the 700-mile trip from Indiana. These filled cells, it was said, were located over the car trucks, and

(Continued on next left-hand page)

THE
FRANKLIN
SYSTEM
OF
STEAM
DISTRIBUTION

*Trade Mark Registered U. S. Patent Office

THE
LOCOMOTIVE
BOOSTER

INCREASED CAPACITY FOR OVERWORKED LOCOMOTIVES

The unprecedented increase of traffic and the difficulty of obtaining new power have imposed a tremendous burden on our railroads. Therefore, it is imperative that they increase the capacity of existing power.

The means for doing this is at hand.

The Franklin System of Steam Distribution provides at least a third more train load-speed capacity.

The Booster* increases the drawbar pull for starting, accelerating and in any tight place.

With these capacity-increasing factors your locomotives will haul more tonnage at higher speeds.

FRANKLIN RAILWAY SUPPLY COMPANY, INC. NEW YORK CHICAGO

In Canada: FRANKLIN RAILWAY SUPPLY COMPANY, LIMITED, MONTREAL

thus were subject to the maximum road-bed vibration.

The cells, which are the outgrowth of the original self-sealing fuel tank for airplanes, can be used in wooden barges for inland waterways and for other types of railroad cars, according to Reid B. Gray, chief of the Martin laboratories. Mr. Gray also said that he had been assured that there is an ample supply of synthetic rubber from which the cells are constructed and that manufacturing facilities are already available.

Another 80,000 Cars?

TRAFFIC estimates, which are creditably reported as indicating that the next car-building program should contemplate the construction of 80,000 freight cars, have been submitted by the Association of American Railroads to the Office of Defense Transportation. The proposal would in effect be the 1943 program, following upon the building of the 62,000 cars authorized for this year by WPB and the former Supply Priorities and Allocations Board.

It might, however, get under way before the end of the year if there should prevail the view of some railroad officers who believe that employment in the carbuilding industry should be made continuous, thus making it possible to hold labor forces, by the placing of production schedules on a monthly basis.

Freight-Car-Building Programs As of August 1

DURING the month of July, there were delivered an additional 839 cars of the original 36,000 authorized by the former Supply, Priorities and Allocations Board for construction subsequent to February 1 of this year. Of this number, 759 were built by contract car builders and 80 by railroad company shops. The number of cars remaining to be shipped under the SPAB program, as of August 1, was thereby reduced to 1,263, of which 833 were in contract car-builders' shops and 430 in railroad company shops.

Of the 18,000 more cars authorized for 1942 construction by the War Production Board, following its limitation order of April 4, releases were granted by the WPB during July covering an additional 2,323 cars, including 322 covered hopper cars and 1,951 tank cars to be constructed in contract car-builders' shops and 50 covered hopper cars in the Chicago, Burlington & Quincy shops.

Deliveries were made of 1,771 of the cars in the WPB program during July, 900 by contract car-builders and 871 by railroad company shops, and there remained to be delivered on August 1 12,545 of the 15,920 released, 8,381 by contract car-builders and 4,164 by railroad shops. With 1,263 cars remaining in the SPAB quota and 2,080 not yet officially released in the WPB quota, there remains therefore but 15,888 more cars to be delivered to complete the 1942 car-building programs.

Details of the reported status of the freight-car-building programs as of August 1 are shown in the accompanying table.

Camp Named in Atterbury's Honor

THE army training camp at Edinburg, Ind., has been named "Camp Atterbury" in honor of the late Brig. Gen. William Wallace Atterbury, former president of the Pennsylvania, who died on September 20, 1934. General Atterbury won high honors in the fields of military and civil transportation not only in this country, but from five foreign countries as well, as the result of his accomplishments as Director General of Transportation of the American Expeditionary Forces on the staff of General Pershing in the first World War. Camp Atterbury is situated near his birthplace—New Albany, Ind.

Aluminum Company Releases New Training Films

PREPARED especially for use in the training of men engaged in the assembly or repair of aluminum parts and equipment, a series of three non-technical films are being made available to industrial employers by the Aluminum Company of America. Excellently photographed, these films show clearly three separate classes of work performed on aluminum. One film is devoted to welding, the second to riveting and the third to the machining of aluminum and the various alloys of aluminum.

The welding film shows recommended procedures for oxy-acetylene, oxy-hydrogen and electric-arc welding and it also illustrates proper set-ups and operations for production welding using machine and brazing processes. The second film of the series covers the essentials important in obtaining properly riveted joints. Machining, choice of tools, proper speeds and feeds, tool preparation, especially rake and relief angles, and the use of cutting oils are dealt with extensively in the other film of the series. Especially interesting is the information given concerning tool preparation which indicates that tool dressing must be such as to give the finest of cutting edges and the smoothest of finishes to any tool used on aluminum. In general, rake and relief angles are greater than those used on tools for cutting ordinary machining steels.

The films are being distributed through the Aluminum Company's offices in Pittsburgh and they are available in 16 mm. and 35 mm. sizes. The 16 mm. size is also available at the Bureau of Mines, Washington, D. C. The pictures were produced by the Jam Handy Organization, New York.

A.A.R. Directors Concerned Over Motive Power

GROWING concern over the adequacy of freight motive power on the country's railroads in the near future was expressed by railroad executives at the monthly meeting of the board of directors of the Association of American Railroads in Washington, D. C., on July 31. Some of the presidents in attendance pointed out that the present movement of oil to the east coast by the railroads is occupying a large number of freight locomotives and that if this movement continues at its present volume a shortage of locomotives may develop.

Joseph B. Eastman, director of defense transportation, attended the meeting and

(Continued on next left-hand page)

Status of Freight-Car-Building Programs—August 1, 1941

SPAB 36,000 CAR PROGRAM—WPB 18,000 CAR PROGRAM

	Contract Car-Builders	*Railroad Company Shops*	*Total*
Number of cars in original SPAB program not yet delivered:			
Automobile	50	..	50
Box	92	..	92
Flat	..	63	63
Gondola	274	..	274
Hopper	131	367	498
Tank	286	..	286
Total	833	430	1,263
Number of cars in additional 18,000-car program of WPB which were released for construction:			
Flat	1,375	1,125	2,500
Gondola	2,326	2,690	5,016
Hopper	3,872	2,209	6,081
Covered Hopper	322	50	372
Tank	1,951	..	1,951
Total	9,846	6,074	15,920
Number of above WPB released cars not yet delivered:			
Flat	1,372	985	2,357
Gondola	1,976	1,853	3,829
Hopper	3,179	1,276	4,455
Covered Hopper	322	50	372
Tank	1,532	..	1,532
Total	8,381	4,164	12,545
Total backlog of cars on order and undelivered:			
Automobile	1,200	675	1,875
Box	8,326	4,113	12,439
Flat	1,372	1,048	2,420
Stock	..	200	200
Gondola	4,995	1,988	6,983
Covered Hopper	397	75	472
Hopper	13,151	3,678	16,829
Tank	1,828	..	1,828
Refrigerator	..	1,492	1,492
Caboose	25	395	420
Total	31,294	13,664	44,958
Number of total cars on order without WPB authority to build	22,080	8,508*	30,588

* After deducting an additional 562 cars (270 cabooses and 292 refrigerator cars) not chargeable against the SPAB or WPB programs.

assured the directors that he would ask the War Production Board to increase the number of locomotives that may now be built under present WPB allocations.

Mr. Eastman, in a statement issued on July 27, said that the Office of Defense Transportation is seeking to avert a motive power shortage by taking steps to increase the efficiency of locomotive operation.

The mechanical section's general plan includes negotiating for the transfer of locomotives from roads that can spare them to roads that need them. Such use of locomotives will be carried out, where necessary, on a lease basis, the borrowing road paying the owner for each day the engine is in service.

Mr. Eastman also disclosed that an inspection tour of various railway shops by representatives of the mechanical section to determine the condition of unserviceable locomotives is now under way. Approximately 7.5 per cent of the total number of steam locomotives are now in the unserviceable class, he noted. The shop survey also covers the availability of materials for repairs.

The number of serviceable freight locomotives now available is about 18,000, Mr. Eastman pointed out. Material allocations to locomotive builders by the War Production Board will make it possible to turn out only about 265 new steam locomotives during the remainder of 1942.

That no motive-power shortage has yet developed, in spite of the sharp increase in power needs resulting from the "unprecedented" volume of freight traffic, is due, Mr. Eastman said, to several factors, one of them being increased efficiency of locomotive servicing. In 1929, Mr. Eastman stated, freight locomotives seldom ran further than 100 to 150 miles before being uncoupled from through trains at district terminal points for servicing and necessary running repairs. At present freight engines frequently run 400 to 500 miles before being cut from trains and sent to the roundhouse.

Surplus Car Material May Be Transferred to Railroads

Car builders and suppliers can transfer surplus freight car material to railroads, under an interpretation of Supplementary Limitation Order L-97-a-1, issued August 26 by the director general for operations of the War Production Board.

The limitation order permits interchange of surplus material between producers under certain conditions, provided such sales have WPB approval. The interpretation, No. 1, makes it clear that railroads which produce or repair railroad equipment are deemed to be engaged in the same business as car producers, and thus are entitled to purchase surplus freight car material from car builders and suppliers.

Equipment Purchasing and Modernization Programs

Chicago & North Western.—Division 4 of the Interstate Commerce Commission has approved a plan whereby this company will be permitted to substitute gondola, hopper, flat or box cars for equipment specifically called for in the equipment trust dated March 5, 1942. The company also asked authority to permit the trustee of the equipment trust to invest some $3,750,000 of the proceeds of the sale of the certificates in government bonds until such time as the equipment called for in the trust is available.

Grand Trunk Western.—Company forces are engaged in rebuilding and extending nine stalls of the roundhouse at Port Huron, Mich., at a cost of approximately $40,000.

Illinois Central.—The Illinois Central has awarded a contract to the Zitterell Mills Company, Webster City, Ia., for repairs and improvements to its shops at Cherokee, Ia., at an approximate cost of $50,000.

New York, New Haven & Hartford.—The New Haven has applied to the Interstate Commerce Commission for authority to assume liability for $1,390,000 of equipment trust certificates to finance in part the purchase at an estimated cost of $1,737,500 of 10 new 2,000 hp. Diesel-electric "A" unit passenger and freight locomotives, which will ordinarily be operated in pairs.

Northern Pacific.—The Northern Pacific has been authorized by Division 4 of the Interstate Commerce Commission to assume liability for the $2,500,000 of two per cent serial equipment trust certificates reported in the August issue as being requested to finance in part the purchase of 12 freight locomotives of the 4-6-6-4 type at a cost of $3,247,183.

Pennsylvania.—The Pennsylvania has been authorized by Division 4 of the Interstate Commerce Commission to substitute certain equipment for other equipment authorized in Finance Docket No. 13567, construction of which was stopped because of War Production Board orders. Details of the equipment originally authorized and that to be substituted were given in the August issue of the *Railway Mechanical Engineer,* page 362.

Seaboard Air Line.—Division 4 of the Interstate Commerce Commission has approved a plan whereby this company will issue $2,280,000 of 2¾ per cent equipment trust certificates which will be either sold to the Reconstruction Finance Corporation or guaranteed by it. The proceeds of the issue, which will mature in 20 semi-annual installments beginning January 1, 1943, will be used to purchase new equipment costing a total of $3,069,760 and consisting of six 5,400-hp. Diesel-electric freight locomotives and two 1,000-hp. Diesel-electric switching locomotives.

Wabash.—The Wabash has invited bids on August 15 on $2,000,000 of series A 10-year equipment trust certificates, payable in 10 equal maturities of $200,000 each beginning August 1, 1943. Although the equipment is reported to have been released by the War Production Board, the indenture will provide that government bonds may be substituted. The equipment, which will cost $2,585,847, includes 520 steel box cars, 125 tight-end automobile cars, 25 end-door automobile cars, 150 gondola cars and 25 covered hopper cars.

Rubber Classifications and Tests Standardized

A joint committee of the American Society for Testing Materials and the Society of Automotive Engineers for several months has been engaged in preparing standard classifications, specifications and tests for natural and synthetic rubbers.

The committee has reduced from several hundred to less than 100 the number of compound classifications, and has established physical properties, characteristics, and standard tests for each compound. The system of classifications, which covers 57 synthetic and 40 natural rubber compounds, is designed both to conserve rubber by enabling industries to select those compounds whose properties are known to meet the requirements of specific uses, and also to make effective use of alternative compounds. Since the classifications cover both natural and synthetic compounds, they will be suitable for use in both the present and post-war periods, and regardless of whether production of synthetic rubber is achieved on a large scale.

Supply Trade Notes

Dan C. Hungerford has resigned as vice-president and director of the Elastic Stop Nut Corporation, Union, N. J.

◆

W. R. Dewey, plant manager, and *R. E. Spokes*, technical director, have been elected vice-presidents of the American Brakeblok division of the American Brake Shoe & Foundry Co.

D. W. Lamoreaux, president of the Peerless Equipment Company, Chicago, has been elected a director of Poor & Co., Chicago.

◆

The Standard Car Truck Company, Chicago, has acquired exclusive manufacturing and sales rights for the Bettendorf swing motion caboose truck and parts. It will now be known as the Barber-Bettendorf caboose truck.

◆

American Locomotive Company.—Five additional assistant superintendents have been appointed for the American Locomotive Company plant at Schenectady, N. Y. The new appointees are *J. W. Biggerstaff; E. W. Bradford; J. P. Fleming; J. A. Graulty* and *J. D. Reynolds.*

(*Turn to next left-hand page*)

EDWARD B. GREENE, president of the Cleveland Cliffs Iron Company and formerly a director of Otis Steel Company, Cleveland, Ohio, was elected a director of the Jones & Laughlin Steel Corporation when that company took over the Otis Steel Company.

◆

FRED C. DAVERN has been appointed assistant manager of the railroad sales department of the Standard Oil Company of New Jersey. Mr. Davern has been railroad sales engineer with Esso since March 1, 1933, covering all eastern railroads. His career in the railroad field began in 1908 in the mechanical shops and drafting room of the Erie at Meadville, Pa.

◆

R. L. ROBINSON has been appointed district sales manager of the Brake Shoe and Castings division and the Southern Wheel division of the American Brake Shoe & Foundry Co., with headquarters in St. Louis, Mo. Mr. Robinson was formerly purchasing agent of the Pittsburgh & West Virginia. He joined the American Brake Shoe as a salesman at Pittsburgh, Pa., in 1928, and was transferred to the Chicago sales staff in 1934.

◆

AMERICAN ROLLING MILL COMPANY.—*L. W. Brashares* has been appointed manager of the Cincinnati district of the American Rolling Mill Company, Middletown, Ohio, and *E. D. Dronberger* has been appointed manager at Dayton, Ohio. *C. G. Farabee* has been appointed manager of the Chattanooga, Tenn., district and *G. C. Wilson*, manager of the Middletown district, has been given a leave of absence because of ill health.

◆

WESTINGHOUSE AIR BRAKE COMPANY.—*C. J. Werlich*, representative of the Westinghouse Air Brake Company at St. Paul, Minn., since 1929, has been appointed southwestern manager, with headquarters at St. Louis, Mo., to fill the position left vacant by the recent death of D. W. Lloyd. Prior to joining the Air Brake Company as a mechanical expert in 1920, Mr. Werlich had served as fireman, locomotive engineer and traveling engineer with the Chicago, St. Paul, Minneapolis & Omaha. *T. W. Baldwin* succeeds Mr. Werlich as representative at St. Paul. Mr. Baldwin joined the Air Brake Company as mechanical expert in 1930, after many years of service as a locomotive engineer on the Chicago, Milwaukee, St. Paul & Pacific, and mechanical expert for the Locomotive Stoker Company. *J. G. Gannon*, mechanical expert at St. Louis since 1940, has been appointed district engineer.

◆

GEORGE R. BERGER, 845 South Wabash avenue, Chicago, has been appointed railroad representative in the United States for the sale of Equatemp insulating felts for refrigerator and passenger cars for the Charles Lachman Co., Inc., of Phoenixville, Pa. Mr. Berger began his business career with the Westinghouse Electric & Manufacturing Co. at Newark, N. J., in 1898. Two years later he entered railway service on the Lake Shore & Michigan Southern at Cleveland, Ohio, becoming chief electrician of that road in 1901. He was associated with the New York Central during the following year in a similar capacity at Mott Haven, N. Y. In 1902, he joined the Gould Coupler Company and the Gould Storage Battery Company at Depew, N. Y., in an engineering capacity and was appointed their joint Western representative, with headquarters in Chicago, in 1904. In 1925 he became manager of western sales and, following the reorganization and segregation of the car-coupler and car-lighting business in 1926, he continued as manager of western sales with the newly incorporated Gould Car Lighting Corporation. On June 1, 1927, he resigned to enter the railway supply business on his own account as a manufacturer's representative. Mr. Berger was elected president of the Railway Electrical Supply Manufacturers Association in 1927.

George R. Berger

Army-Navy Production Awards

RECOGNITION of high achievement in the production of war equipment has been made by the presentation of the Army-Navy "E" to the following companies:

American Locomotive Company, Schenectady, N. Y. August 26. Award presented to Duncan W. Fraser, president of the American Locomotive Company, by Maj. Gen. Charles T. Harris, commanding officer of the Aberdeen Proving Ground, Aberdeen, Md. Token presentation of pins by Capt. J. S. Evans, naval ordnance inspector at Schenectady. The Schenectady plant of the American Locomotive Company first received the Navy E award on October 24, 1942. It was renewed on May 23, 1942.

The Bullard Company, Bridgeport, Conn. August 24. Award presented by Col. F. H. Payne, assistant chief of the Springfield Ordnance District, and accepted by E. P. Bullard, president of the company. "E" pins presented to Vincent E. Hughes, chairman of the Bullard War Service Club, an employees organization, by Lt. Commander R. T. Fish of the Hartford Naval Office.

Greenfield Tap and Die Corporation, Greenfield, Mass. August 19.

H. K. Porter Company, Pittsburgh, Pa.

A. VAN HASSEL, president of the Magor Car Corporation of New York, has been elected vice-president and director of the National Steel Car Corporation, Ltd., of Canada.

◆

ROBINSON D. BULLARD, reclamation engineer for the Bullard Company, Bridgeport, Conn., has been appointed technical consultant to the industrial salvage section of the bureau of industrial conservation of the War Production Board. Mr. Bullard will assist in preparing a definitive book on industrial reclamation.

◆

BEATTY MACHINE AND MANUFACTURING COMPANY.—At a recent meeting of the board of directors of the Beatty Machine and Manufacturing Company, Hammond, Ind., the following officers were elected: *W. R. Beatty*, chairman of the board; *L. C. Beatty*, president; *P. H. Beatty*, vice-president; *Charles Aaron*, secretary; *W. Perz*, treasurer, and *Miss C. Kasten*, assistant secretary and treasurer.

◆

HUGO E. BECKER, a sales engineer of the Westinghouse Electric & Manufacturing Company on the Pacific Coast since 1925, has been appointed supervisor of the newly created maintenance sales department for the Pacific Coast district. In this new position Mr. Becker will coordinate the work of three major maintenance divisions of the company—renewal parts, field engineering, and repair plants. He will also coordinate maintenance of existing Westinghouse equipment in the marine industry, of electric utilities, and on transportation systems.

◆

GISHOLT MACHINE COMPANY.—The Gisholt Machine Company, Madison, Wis., has announced several new appointments to their field sales and service personnel in the United States and Canada. Direct sales representatives and agents have been appointed as follows: *Ray Hering*, to the Cleveland, Ohio, office; *Earl K. Baxter*, to the Detroit, Mich., office; *B. C. Greene*, and Steel & Machine Tool Sales, Inc., to the Houston, Tex., territory; the Dawson Machinery Company to the Seattle, Wash., territory; and the Foulis Engineering Sales Company to the Nova Scotia and New Brunswick, Canada and Newfoundland territories, with offices at Halifax, N. S. Direct service representatives have been appointed as follows: *John T. Murray*, to the Dayton, Ohio, office; *Grover Pruett* and *Philip E. Denu*, to the Newark, N. J., office, and *Alfred Math Kuehn*, to the Lockport, N. Y., Pittsburgh, Pa., and Toronto, Canada, territories, with headquarters in Lockport. Agents' sales representatives have been appointed as follows: *D. O. Vincent*, in the Atlanta, Ga., territory; *D. M. Ward*, to cover southern Georgia and Florida, with headquarters at Jacksonville, Fla.; Gordon N. Russell, Ltd., to the British Columbia, Canada territory, with headquarters in Vancouver, Canada, and *C. B. Spaulding*, to the Windsor, Ontario, Canada territory, with headquarters at Windsor.

Victor W. Ellett, president of the Hunt-Spiller Manufacturing Corporation, Boston, Mass., who has become also vice-chairman of the board of directors, as noted in the August *Railway Mechanical Engineer,* started his career as a machinist apprentice with the Atchison, Topeka & Santa Fe at Madison, Iowa, in 1897. From 1901 to 1903 he served as a machinist with the St. Louis, Iron Mountain and Southern

Victor W. Ellet

(now the Missouri Pacific), the Fort Worth & Denver City, and the Choctaw, Oklahoma & Gulf (now the Chicago, Rock Island & Pacific). In 1903-04 he was a machinist for the Santa Fe; 1904-05, an expert tool maker at the United States Government's Rock Island arsenal; 1905-06, a mechanical officer of the Missouri Pacific, and 1906-11, a mechanical officer of the Rock Island. He joined the Hunt-Spiller Manufacturing Corporation as a mechanical representative in 1911 and was appointed sales manager of that company in 1925, vice-president in 1928, and president and general manager in 1936.

Obituary

Perrin G. March, president of the Cincinnati Shaper Company, died in July at his home in Fernbank, Ohio.

◆

Earl Hammond Fisher, assistant to the president of the Wine Railway Appliance Company and assistant to the vice-president of the Unitcast Corporation, Toledo, Ohio, died August 9. Mr. Fisher was 47 years of age.

◆

John P. Sykes, who, prior to his retirement in 1938, had advanced from apprentice to senior vice-president of the Baldwin Locomotive Works during 59 years of service with that company, died August 16. He was 82 years of age. Mr. Sykes joined the Baldwin Locomotive Works as an apprentice in 1879. His advancement was steady and he served in the capacities of contractor, assistant foreman and general foreman until 1905, when he was appointed general superintendent of the (then new) Eddystone, Pa., shops. In 1907 he left the parent company to become general superintendent of its subsidiary, the Standard Steel Works Company, at Burnham, Pa., returning to Baldwin in 1910 as assistant general superintendent. In July, 1911, he was appointed general superintendent, and in September, 1917, became vice-president

John P. Sykes

in charge of manufacture. In May, 1922, he was appointed senior vice-president in charge of plants and manufacture, and in 1931 was elected a director. Mr. Sykes resigned his positions and retired from active participation in the affairs of the Baldwin Locomotive Works in March, 1938.

◆

John G. Benedict, president of the Landis Machine Company, died in the Waynesboro Hospital, Waynesboro, Pa., on August 4, after an illness of two years. Mr. Benedict was born near Ringgold, Md., April 21, 1872. He attended the public schools of Waynesboro and was graduated in 1898 from the State Teachers College, Shippensburg, Pa. He taught school for several years during his college career and for two years following graduation. He started his industrial career in 1900 as an employee in the office of the Landis Tool Company. A little later he became identified with the Fred Frick Clock Com-

John G. Benedict

pany, Waynesboro, as secretary. Then he was appointed branch manager for Minneapolis for the Geiser Manufacturing Company, also of Waynesboro. Early in 1904 he was called to Waynesboro to become secretary and treasurer of the Landis Machine Company. Mr. Benedict was also President of the Canadian Landis Machine Company, Welland, Ont.

◆

T. Aurelius, who retired in 1940 as vice-president and manager of sales of the Railroad division of the Colorado Fuel & Iron Co., Denver, Colo., died on July 31.

◆

Thomas F. Kilcoyne, traveling engineer for the American Arch Company, Inc., died August 10, at Cincinnati, Ohio. Mr. Kilcoyne had been associated with the American Arch Company for 30 years. He was formerly a boilermaker on the Pennsylvania at Altoona, Pa., and a boiler inspector for the Chesapeake & Ohio at Huntington, W. Va.

Personal Mention

General

R. L. Rex has been appointed mechanical assistant of the New York, Ontario & Western.

Gerald P. Trachta, assistant chief operating officer-mechanical of the Chicago, Rock Island & Pacific, has been appointed general superintendent of motive power, with headquarters as before at Chicago. This is a change of title.

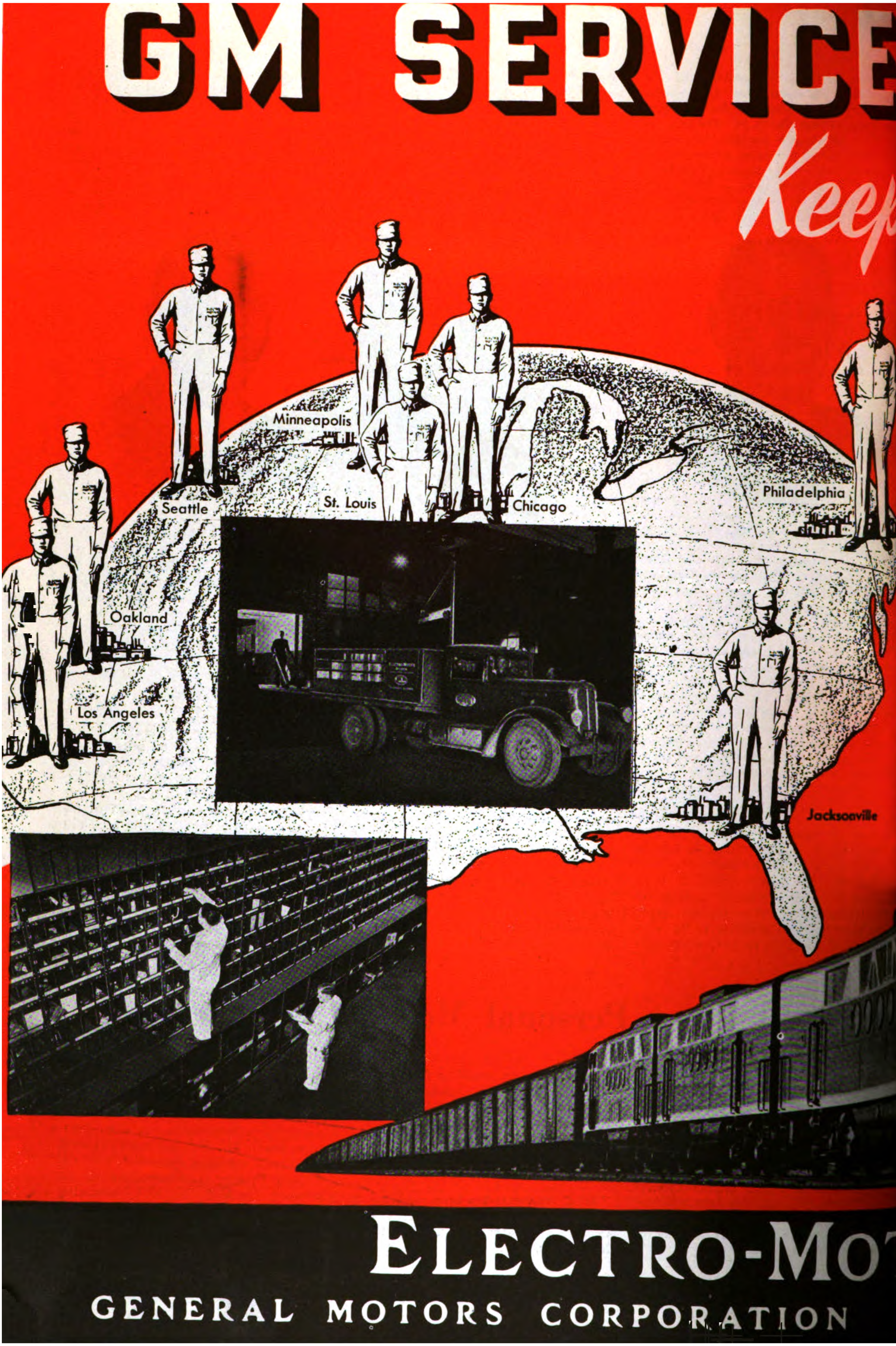
E. H. Talbert, traveling fireman, Hinton division, of the Chesapeake & Ohio, has become motive-power inspector.

L. W. Withrow, mechanical assistant, operators, of the Chesapeake & Ohio, the Nickel Plate and the Pere Marquette, has retired.

M. C. Prentiss has been appointed engineer of motive power of the New York, Ontario & Western, with headquarters at Middletown, N. Y.

S. M. Houston, assistant superintendent of motive power of the Southern Pacific at Los Angeles, Calif., has been appointed assistant general superintendent of motive power, with headquarters at San Francisco, Calif. Mr. Houston started railroad work as a machinist apprentice with the Arizona Eastern (now controlled by the Southern Pacific) in 1913, advancing through various positions to master mechanic in 1923. In 1924 he was trans-

(*Continued on second left-hand page*)


GM SERVICE
Kee
Minneapolis
Seattle
St. Louis
Chicago
Philadelphia
Oakland
Los Angeles
Jacksonville
ELECTRO-MO
GENERAL MOTORS CORPORATION

ferred to the Southern Pacific of Mexico as shop superintendent at Empalme, Son., later becoming successively superintendent of motive power and assistant general manager. In 1937 he was appointed assistant master mechanic of the Western division of the Southern Pacific at West

S. M. Houston

Oakland, Calif., and a year later became master mechanic. Mr. Houston was appointed assistant superintendent of motive power at Los Angeles in March, 1939.

George McCormick, general superintendent motive power of the Southern Pacific at San Francisco, Calif., retired on July 31. Mr. McCormick was born at Columbus, Tex., on July 15, 1872, and was a graduate in mechanical engineering from the Agricultural and Mechanical College (now Texas A. & M.) at Bryan, Tex., in 1891. He entered railway service on October 5, 1891, as a machinist apprentice in the employ of the Galveston, Harrisburg & San Antonio (now part of the Southern Pacific Lines in Texas and Louisiana) at Houston, later being promoted to draftsman in 1893 and transferred to San Antonio in 1894. He returned to Houston in 1895 as chief draftsman. In 1900 he was promoted to the position of mechanical engineer and in December, 1911, became assistant superintendent of the El Paso division, with headquarters at El Paso, Tex. In February, 1913, Mr. McCormick was appointed assistant general manager (mechanical) of the Southern Pacific, Texas lines, with headquarters at Houston, and in December, 1916, became general superintendent of motive power of the Pacific lines, with headquarters at San Francisco. Mr. McCormick invented many safety devices for locomotives, including an improvement in the design and application of locomotive boiler drop plugs to prevent boiler explosions, retaining clips to prevent loose tires from slipping off wheel centers and a truck pedestal safety tie bar. He also invented a system of oil lubrication for locomotive driving boxes and other bearings. He has been responsible for the development of outstanding types of motive power on the Southern Pacific, including the streamline Daylight type of locomotive and the cab-ahead articulated-consolidation locomotives. In recognition of his many contributions to railroad engineering, he was named a "modern pioneer" by the National Association of Manufacturers in 1940, and in 1941 was awarded the honorary degree of Doctor of Engineering by his alma mater, Texas A. & M. He has served on numerous important committees of the Mechanical division of the Association of American Railroads, and was elected a member of the General committee of the Mechanical division in 1939. More complete biographical

George McCormick

data concerning the training and accomplishments which led to his honorary degree of Doctor of Engineering at Texas A. & M. appear in the January, 1942, issue of the *Railway Mechanical Engineer*, page 15.

Ben M. Brown, assistant general superintendent of motive power of the Southern Pacific, has been appointed general superintendent of motive power, with headquarters as before at San Francisco, Cal., succeeding George McCormick, who retired on July 31. Mr. Brown was born at

Ben M. Brown

Rockport, Tex., on June 15, 1890, and is a graduate in mechanical engineering from Texas A. & M. (1911). He entered railway service on June 15, 1911, as a special apprentice in the employ of the Galveston, Harrisburg & San Antonio, later serving as a draftsman at Houston, Tex., and apprentice instructor at the San Antonio (Tex.) shops. In 1914 he became enginehouse foreman at Beaumont, Tex., later serving as drop-pit foreman at Houston and enginehouse foreman at El Paso. Mr. Brown was appointed general shop foreman at Houston in 1916, and master mechanic at El Paso in 1919. In 1923 he became assistant superintendent of motive power and equipment of the Southern Pacific Lines in Louisiana, with headquarters at Algiers, La. Two years later he returned to the Texas lines as chief assistant superintendent of motive power, with headquarters at Houston. On November 15, 1936, he was transferred to the Southern Pacific, Pacific lines, as assistant general superintendent of motive power, with headquarters at San Francisco.

L. H. Oaks, assistant road foreman of engines on the Ft. Wayne division of the Pennsylvania, has been promoted to general air brake inspector of the Western region, with headquarters at Chicago.

A. H. Glass, motive power inspector of the Chesapeake & Ohio, has been appointed mechanical assistant, operators, of the Chesapeake & Ohio, the Nickel Plate and the Pere Marquette.

F. E. Russell, Jr., master mechanic of the Southern Pacific at El Paso, Tex., has been appointed assistant superintendent of motive power, with headquarters at Los Angeles, Calif.

Master Mechanics and Road Foremen

D. A. Guidry, locomotive engineer of the Illinois Central, Baton Rouge, La., has become fuel engineer at Chicago.

W. M. Tollefson, locomotive engineer of the Illinois Central at Waterloo, Iowa, has become fuel engineer at Memphis, Tenn.

H. O. Welch, fireman instructor of the Atlantic Coast Line at Waycross, Ga., has been appointed road foreman of engines with headquarters at Waycross.

T. B. Dobbins, general foreman of the Atlantic Coast Line at Thomasville, Ga., has been appointed master mechanic at Waycross, Ga.

F. Webb, fuel engineer of the Illinois Central at Chicago, has been promoted to traveling engineer on the Iowa division, west of Waterloo, Iowa.

Harwood S. Flippen has been appointed road foreman of engines of the Atlantic Coast Line, with headquarters at Wilmington, N. C.

D. R. Calleri, assistant master mechanic of the Southern Pacific at Roseville, Calif., has been appointed master mechanic, with headquarters at El Paso, Tex.

T. C. Nelms, fuel engineer of the Illinois Central at Memphis, Tenn., has been promoted to traveling engineer on a portion of the Kentucky division.

A. H. Williams, general foreman of the Atlantic Coast Line, with headquarters at Wilmington, N. C., has been appointed master mechanic of the Wilmington district, with the same headquarters.

(*Turn to next left-hand page*)

R. H. DUNCAN, general foreman of the Atlantic Coast Line, with headquarters at Montgomery, Ala., has been appointed master mechanic of the Montgomery district, with the same headquarters.

J. C. MILLER, superintendent of shops of the New York, Chicago & St. Louis at Conneaut, Ohio, has been appointed master mechanic of the Nickel Plate district, with headquarters at Conneaut.

Car Department

G. J. FLANAGAN, has been appointed general car inspector of the New York Central system, with headquarters at New York.

C. N. KITTLE has been appointed division general car foreman of the New York Central, with headquarters at Buffalo, N. Y.

T. W. GABLER has been appointed division car foreman, Mahoning division, of the Erie, with headquarters at Brier Hill, Ohio.

Shop and Enginehouse

E. Y. NITRAUER, shop superintendent of the Erie at Susquehanna, Pa., has been transferred to the position of shop superintendent at Port Jervis, N. Y.

P. M. MITCHELL, shop superintendent of the Erie at Port Jervis, N. Y., has been appointed chief shop inspector, with headquarters at Cleveland, Ohio.

F. C. WENK, road foreman of engines of the Atlantic Coast Line at Waycross, Ga., has been appointed general foreman at Thomasville, Ga.

L. S. KURFESS, chief shop inspector of the Erie at Cleveland, Ohio, has been furloughed to accept a commission in the United States Army.

H. G. DUGAN has been appointed general and erecting-shop foreman of the shops of the New York, Chicago & St. Louis, with headquarters at Conneaut, Ohio.

A. H. ADANG, general and erecting-shop foreman of the shops of the New York, Chicago & St. Louis at Conneaut, Ohio, has been appointed superintendent of the shops at Conneaut.

L. E. SCHUETTE, division car foreman of the Mahoning division of the Erie, at Brier Hill, Ohio, has been appointed shop superintendent at Susquehanna, Pa.

C. A. WHITE, general foreman of the Atlantic Coast Line at Waycross, Ga., has been furloughed for military duty as a major in the 703rd Engineers, Railway Grand Division, U. S. Army.

Purchasing and Stores

T. P. HARRIS, purchasing agent of the Grand Trunk Western at Detroit, Mich., has been appointed purchasing agent of the Canadian National, with headquarters at Winnipeg, Man. Mr. Harris was born at Bristol, England, on October 26, 1896, and entered railway service in June, 1911, with the Grand Trunk Western. He left that road in February, 1915, to enlist in the Canadian Expeditionary Force, and on demobilization in May, 1919, Mr. Harris returned to the purchasing department. He was appointed purchasing agent at Detroit in July, 1938.

GEORGE L. MITCHELL, assistant to the executive vice-president and assistant secretary of the Atlantic Coast Line, has been appointed to the newly created position of assistant purchasing agent, with headquarters as before at Wilmington, N. C.

H. M. DEWART, purchasing agent of the Central Vermont, at St. Albans, Vt., has been appointed purchasing agent of the Grand Trunk Western with headquarters at Detroit, Mich. Mr. Dewart was born at St. Albans, Vt., on April 17, 1893, and entered railway service as a clerk in the accounting department of the Central Vermont at St. Albans. In May, 1912, he was transferred to the purchasing department and appointed chief clerk on November 1, 1913. In 1917 he became assistant purchasing agent and in June, 1918, purchasing agent at St. Albans.

Obituary

THOMAS B. WHITEHEAD, for 21 years general foreman of the boiler department of the Seaboard Air Line shops at Jacksonville, Fla., died on August 12, after a long illness.

JAMES A. CARNEY, at one time superintendent of shops of the Chicago, Burlington & Quincy at West Burlington and later successively, superintendent of shops at Aurora, Ill., supervisor of fuel economy at Chicago, and superintendent of safety, died of a heart attack at his home in Aurora on July 17. Mr. Carney had retired in 1937.

CHARLES JAMES, who retired as superintendent of motive power of the Erie on February 28, 1938, died at his home in Shaker Heights, Ohio, on July 24 in his 76th year. Mr. James entered the service of the Erie as a machinist at Huntington, Ind., on December 19, 1890, and was appointed superintendent of motive power on November 1, 1927, with headquarters at New York, being transferred to Cleveland, Ohio, in 1931. Prior to going with the Erie Mr. James served for ten years with the Lake Shore & Michigan Southern (New York Central).

Trade Publications

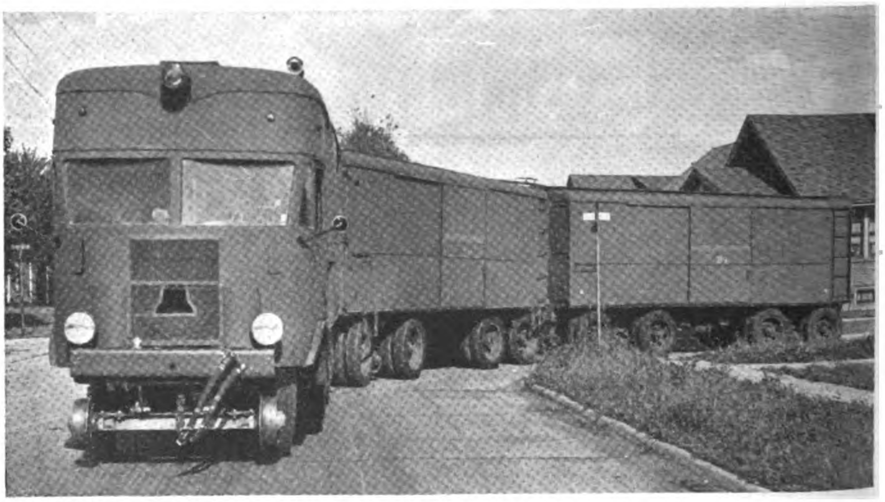
Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

WELDING ELECTRODE CONSERVATION.—Air Reduction Sales Co., 60 East Forty-second street, New York. Fourteen-page "fight waste" bulletin consisting of a series of shop posters illustrating common wasteful arc-welding practices and corresponding good practices.

◆

MACHINING ALUMINUM. — Aluminum Company of America, Pittsburgh, Pa. New edition of "Machining Alcoa Aluminum," in two parts—General Machining Practice and Automatic Screw Machine Practice. Sets forth general principles of machining aluminum and its alloys; suggests speeds, feeds and depths of cut; points out where practices and tools common to other metals may be used, and indicates where special practices or tools are desirable.

* * *



A three-unit auto-railer train designed to carry explosives from point to point within a large Midwestern ordnance plant

The train, built by the Evans Products Company, consists of a locomotive unit and two trailers. The locomotive is powered by a six-cylinder, 125-hp. Waukesha gasoline engine and is driven through a conventional automotive transmission with rear-end drive to two double-wheeled driving axles. Pneumatic-tired wheels, 36 in. in diameter, carry the load at all times, both on and off the rails, but retractable flanged steel wheels (four per unit) serve to hold the cars on the rails when moving on the track. All three units are equipped with standard Westinghouse AB air brakes controlled from the cab, but operating on brake drums on the inner of each pair of rubber-tired wheels. Separate sets of brake equipment are provided for track and highway operation. The wheels on all three units follow in the path of the wheels on the locomotive, their movement being controlled through tow bars.

Railway Mechanical Engineer

October
1942
FOUNDED IN 1832

Published monthly by Simmons-Boardman Publishing Corporation. 1309 Noble Street, Philadelphia, Pa. Entered as second-class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, $3.00 for one year, U. S. and Canada. Single copies 35 cents. Vol. 116, No. 10.

RAILWAY MECHANICAL ENGINEER

Founded in 1832 as the American Rail-Road Journal

With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office.

Volume 116 *No. 10*

OCTOBER, 1942

Published on the second day of each month by

Simmons-Boardman Publishing Corporation

1309 Noble street, Philadelphia, Pa. Editorial and Executive Offices: 30 Church street, New York, and 105 West Adams street, Chicago. Branch offices: Terminal Tower, Cleveland; 1081 National Press bldg., Washington, D. C.; 1038 Henry bldg., Seattle, Wash.; 300 Montgomery street, Room 805-806, San Francisco, Calif.; 530 W. Sixth street, Los Angeles, Calif.

Subscriptions (including, when published, the daily editions of the Railway Age, published in connection with the convention of the Association of American Railroads, Mechanical Division), payable in advance and postage free, United States, U. S. possessions and Canada: 1 year, $3; 2 years, $5. Foreign countries, not including daily editions of the Railway Age: 1 year, $4; 2 years, $7. Single copies, 35 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.), and is indexed by the Industrial Arts Index and also by the Engineering Index Service. Printed in U. S. A.

RAILWAY MECHANICAL ENGINEER

Basic Research Improves

Passenger-Truck Performance

Controlled bolster action, secured by the installation of four-link bolster guides, free swing hangers, lateral-motion hydraulic energy absorbers and elliptic spring covers, has greatly improved car riding qualities

IN 1935 a research program was initiated by the Chrysler Corporation, based on its automobile ride developments, and aimed at improving the riding quality of railroad rolling stock. Experimentation has been carried on continuously since that time, both in the laboratory and on the road. The New York Central, the Pennsylvania, and the Pullman Company have actively collaborated with Chrysler in securing marked improvement in riding comfort.

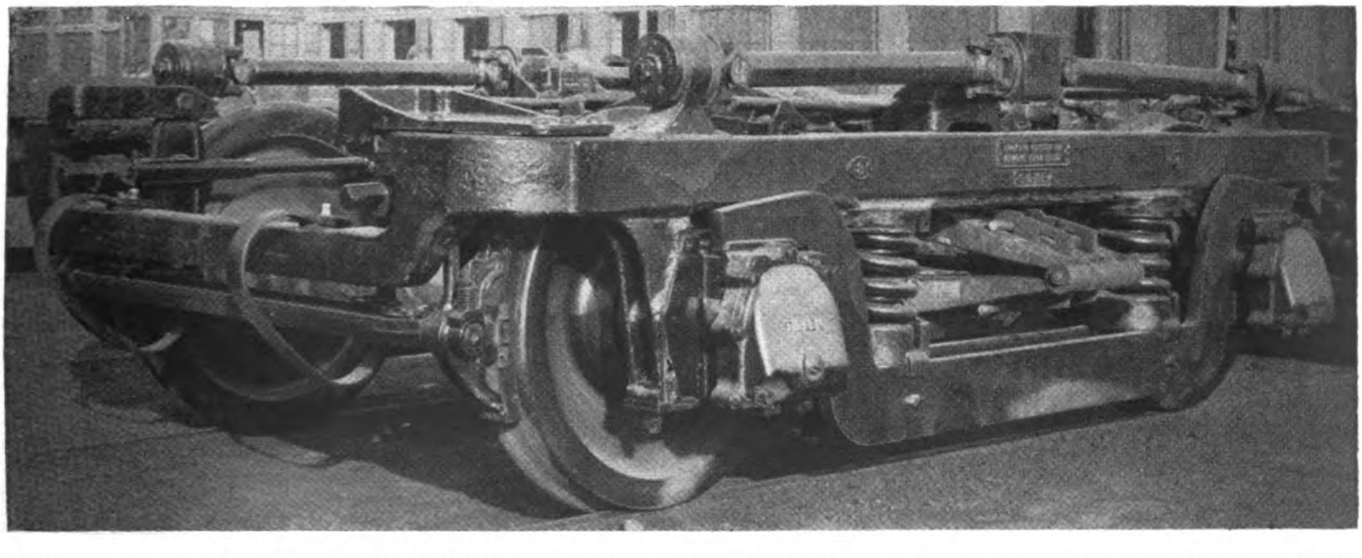
The scope of the development work extends to all fundamental factors affecting the riding performance of rolling stock. An essential part of the program has been to devise new methods for accurately measuring this performance in terms of the vertical and lateral accelerations transmitted to the car body. The successful solution of the instrumentation problem has made it possible not only to evaluate the extent of changes in performance, but to establish a criterion of riding quality.

The results achieved include the development of new passenger car trucks, which combine a notable improvement in passenger comfort with marked reduction in weight. The present article is limited to certain portions of this development, which have been incorporated in a coordinated group of accessory units and are now available for the purpose of rehabilitating standard types of passenger trucks.

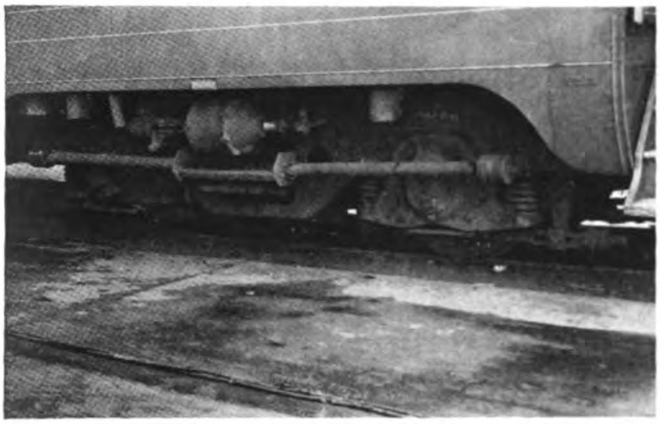
At the outset of the experimental road-test program it was recognized that accurate, reliable instrumentation of high sensitivity would be indispensable in properly evaluating the effects of equipment changes. While satisfactory accelerometers were available for counting vertical shocks, a thorough study showed that there was no adequate unit to perform the much more difficult function of accurately integrating the lateral accelerations.

Starting with a Gray contact-type accelerometer with counter recording, a unique set-up was developed which has proved to be sensitive and reliable in measuring lateral accelerations. The accelerometer unit is securely mounted on a pivoted base which acts like a pendulum to neutralize centrifugal forces. This prevents any change in the accelerometer calibration which would otherwise result from rocking of the car body or from the action of centrifugal force on curves. Two such units, each with a separate bank of five counters, are used in a car to obtain the total number of accelerations of five different intensities in both lateral directions.

An important feature of the pendulum-mounted ac-



A drop-equalizer truck equipped with four-link bolster positioning, metallic elliptic spring covers, and variable resistance lateral-motion hydraulic energy absorbers on the bolster



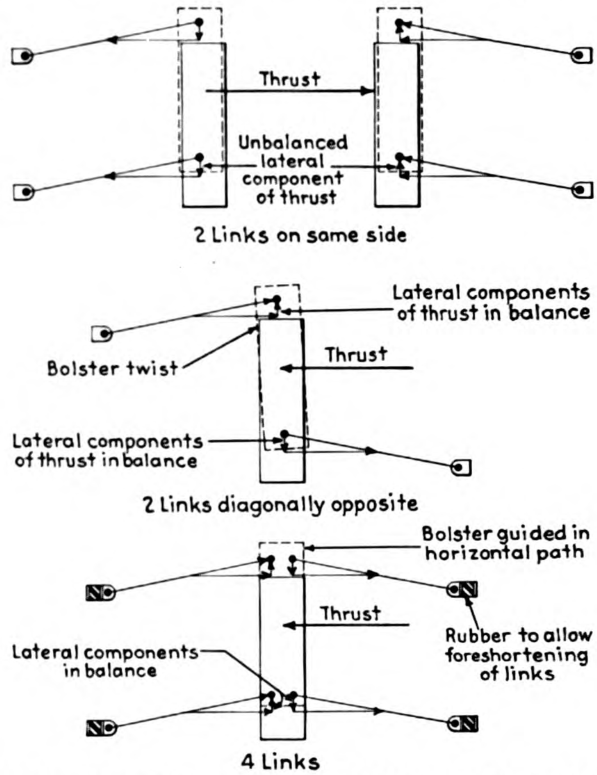
A four-link bolster positioning installation on a triple-bolster truck

celerometer is that the centers of percussion of the accelerometer inertia elements lie on the pivot axis of the swinging platform. This prevents the pendulum action from cushioning the accelerometer against the lateral shocks to be measured. Oil dashpots are employed to dampen the oscillations of the pendulum base.

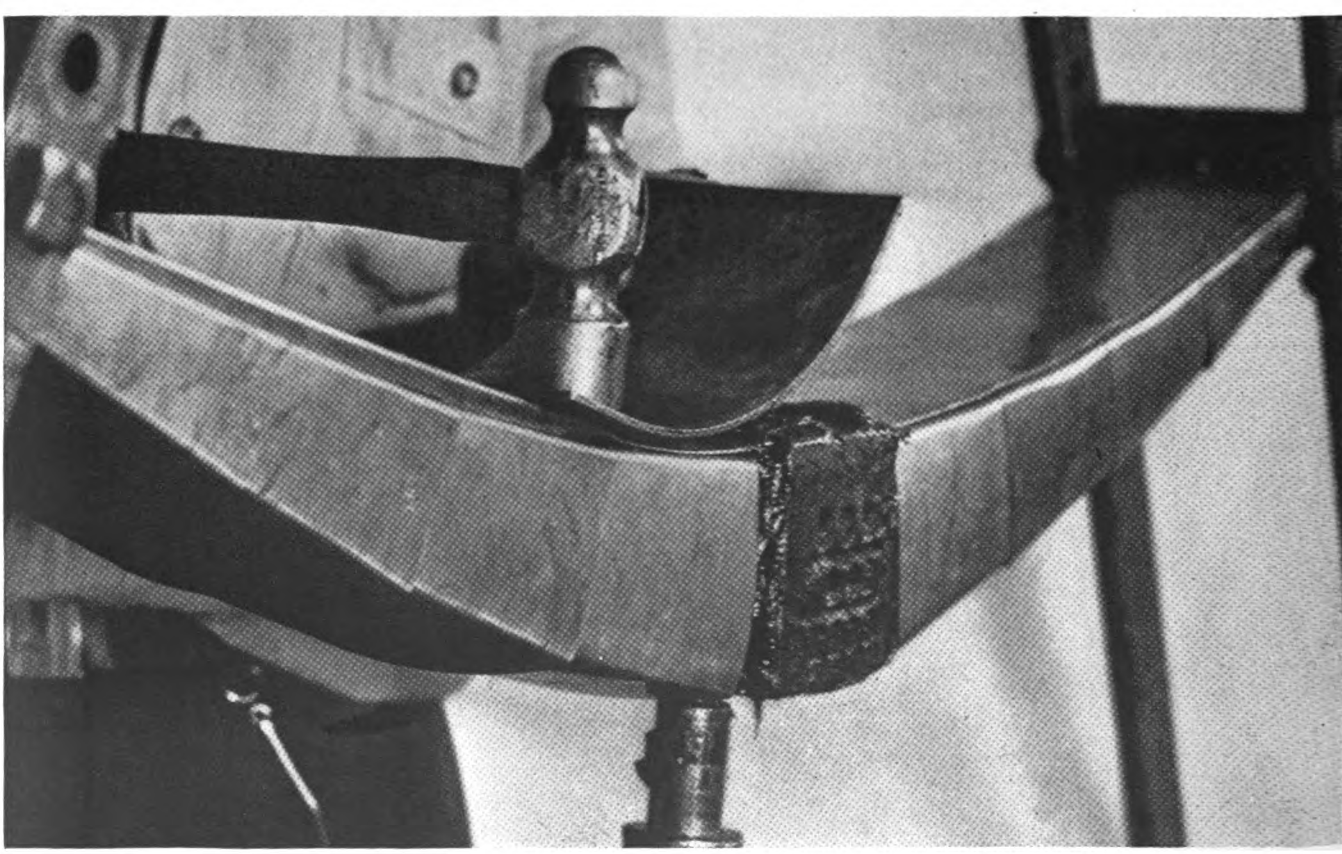
For measuring vertical accelerations similar accelerometer units are used, secured solidly to the platform casting or the center sill. In this case, the instrument is mounted so that the inertia elements act vertically instead of laterally. Two units are used per car, usually at the truck centers. The accelerometer elements of each unit are calibrated for five different acceleration intensities, which record on separate counters, as in the case of the lateral instruments.

Early in the investigation it was discovered that a free bolster is essential to proper lateral action and further experience proved that any step taken to free the bolster from frictional restraint goes far toward improving the lateral performance, irrespective of the truck type. The swing hangers, when free to move, provide an insulating suspension for keeping out the car body lateral disturbances originating at the rail.

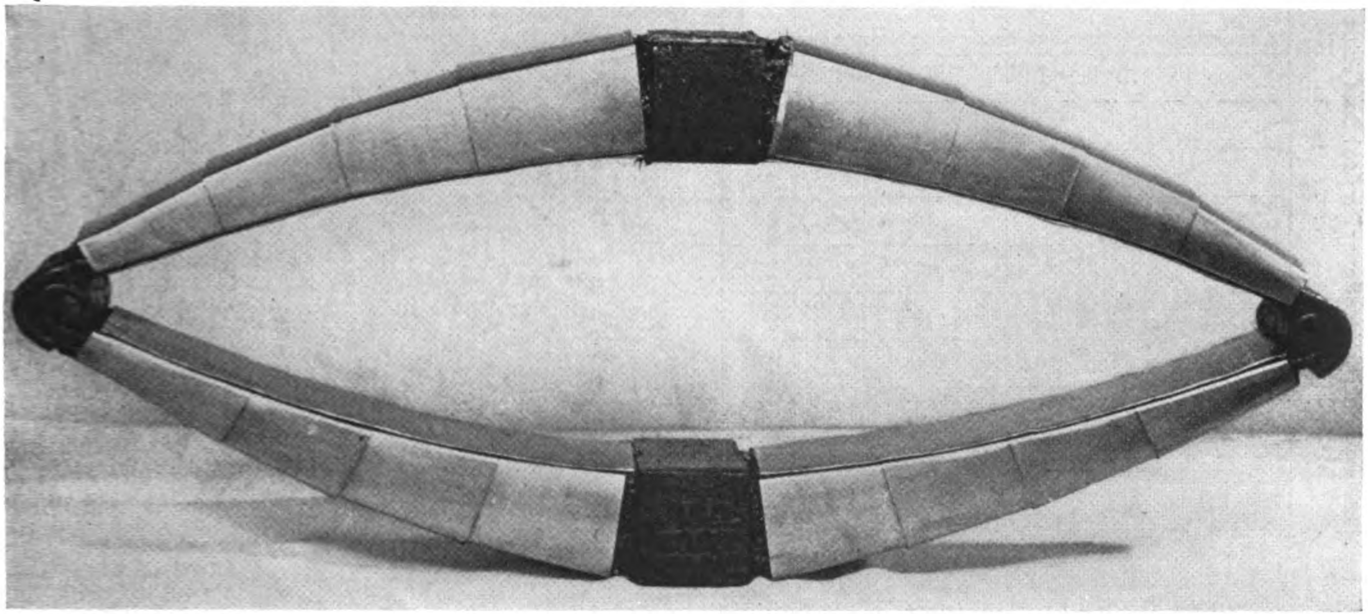
This improvement was effected in two steps. The



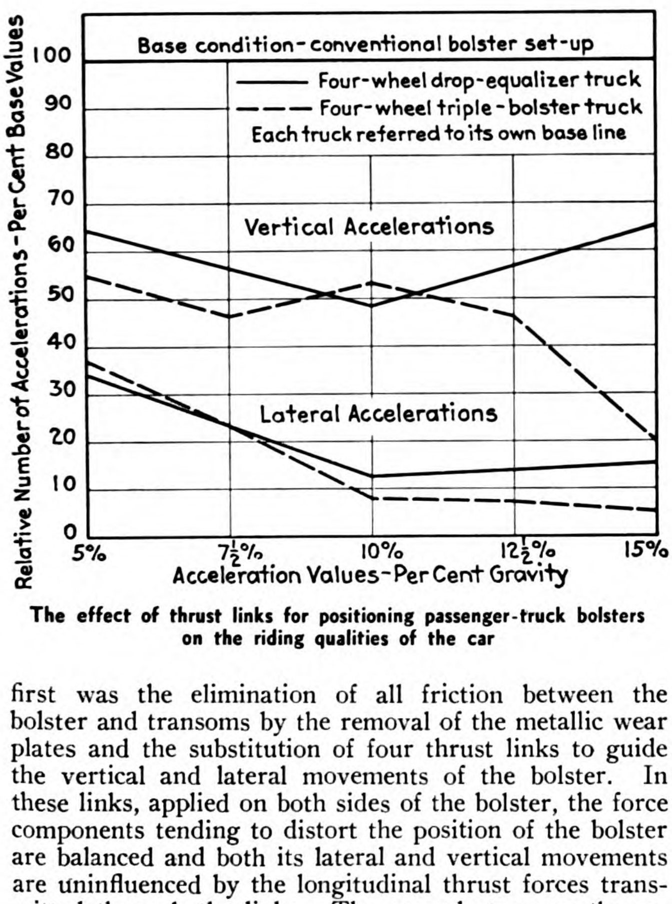
Force diagrams of three arrangements of bolster-positioning links



Applying the metallic telescoping spring covers to an elliptic spring—After the one-piece cover has been snapped in place over the flanges of the telescoping section, the joints are permanently closed by crimping



Telescoping metal spring covers applied to the elliptic springs of a passenger car



The effect of thrust links for positioning passenger-truck bolsters on the riding qualities of the car

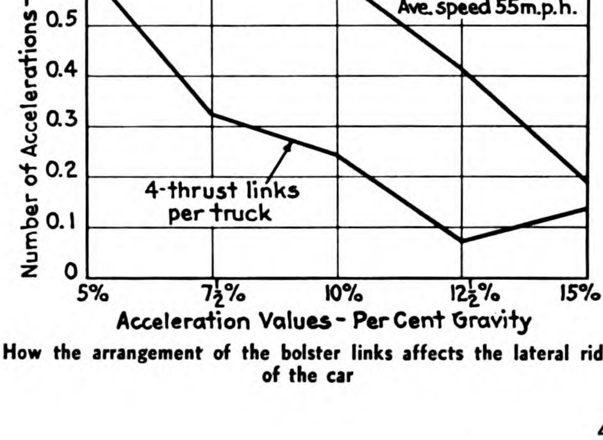
first was the elimination of all friction between the bolster and transoms by the removal of the metallic wear plates and the substitution of four thrust links to guide the vertical and lateral movements of the bolster. In these links, applied on both sides of the bolster, the force components tending to distort the position of the bolster are balanced and both its lateral and vertical movements are uninfluenced by the longitudinal thrust forces transmitted through the links. The second step was the reduction of the friction in the bolster swing-hanger assembly by the substitution of rockers for friction-type bearings.

During the road tests it was found that the vertical riding qualities invariably grew progressively worse as the tests proceeded due to the uncontrolled increase in the friction between the elliptic bolster-spring plates caused by the accumulation of corrosion and dirt. This led to the development of metallic covers for the elliptic springs within which the springs, after having been cleaned, can be kept permanently lubricated.

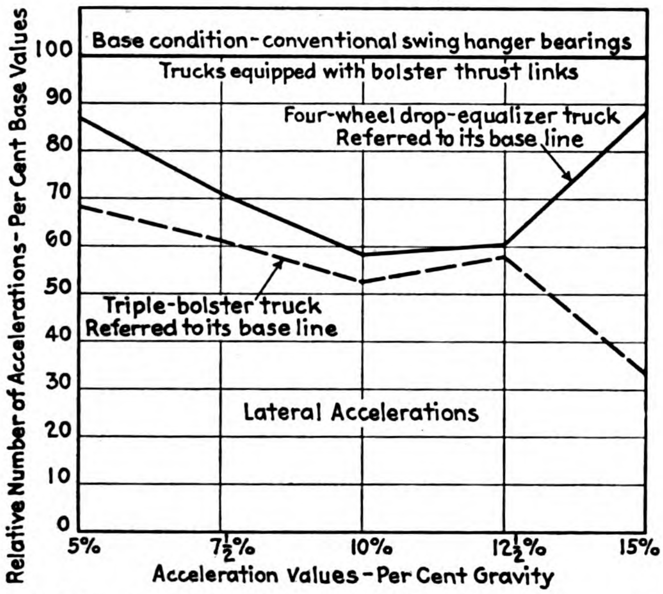
The third improvement was effected by the application of a Houdaille hydraulic energy absorber to cushion large lateral movements of the bolster.

The improvements in riding qualities effected by these changes are presented in a series of graphs showing the reduction in the number of lateral movements recorded at acceleration intensities varying from 5 per cent to 15 per cent of gravity. The installation of four bolster thrust links on a conventional drop-equalizer type of four-wheel truck reduced the number of 5-per-cent gravity shocks 70 per cent, as compared with the same truck equipped with the conventional bolster, and reduced the number of 15-per-cent gravity shocks 85 per cent, as compared with the conventional bolster. Installed on the Pullman triple-bolster type of truck, the improvement in the ride was of about the same order.

While primarily designed for the improvement of lateral action, the thrust links also effected considerable improvement in the vertical action of the bolster by elim-

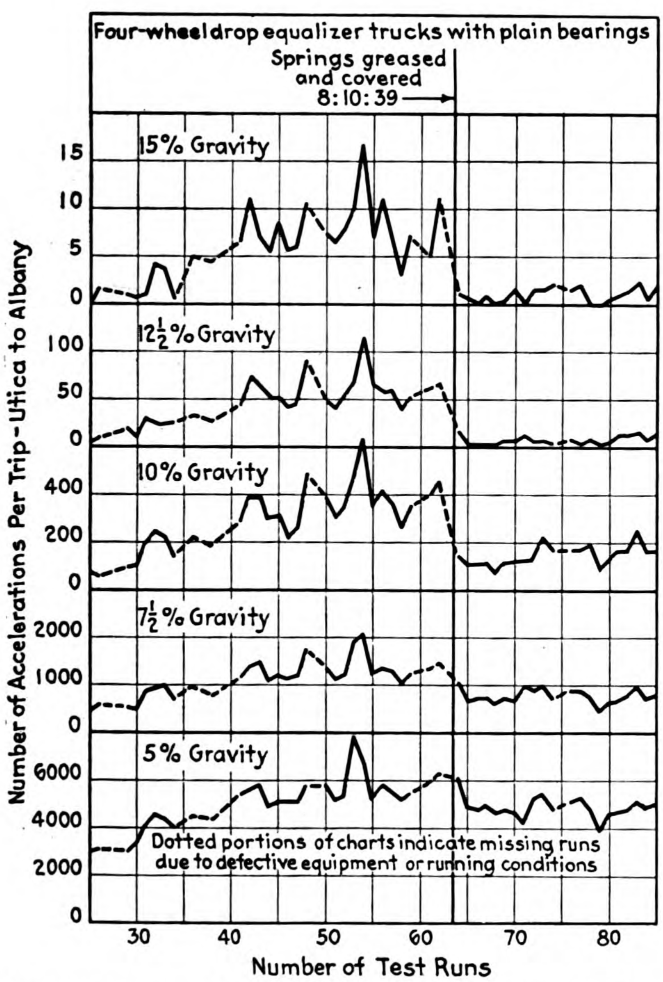


How the arrangement of the bolster links affects the lateral ride of the car



Lateral improvement effected by substitution of rocker type swing hanger for hangers with friction bearings

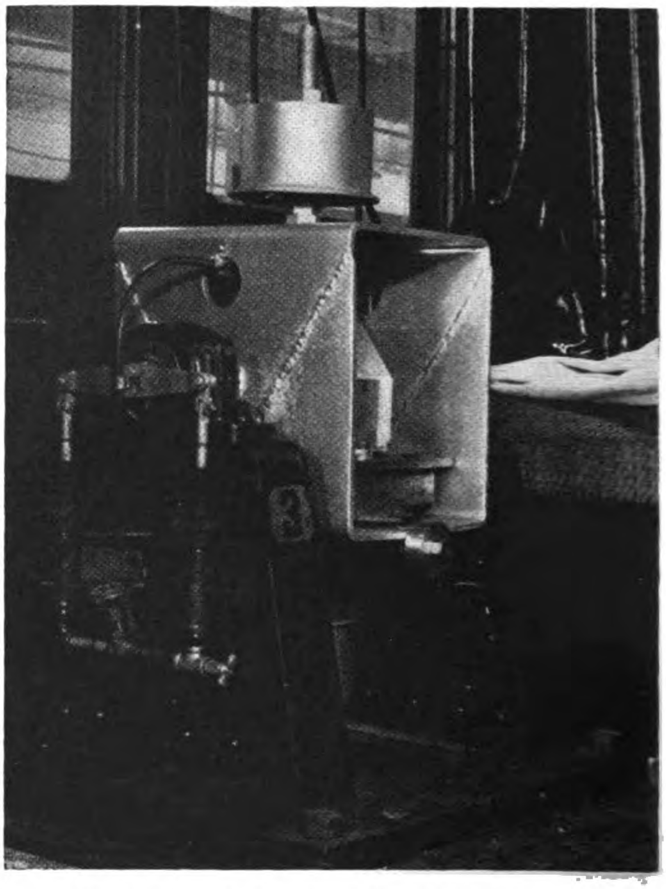
inating the frictional drag of the wear plates. In this case the reduction in the numbers of both the lowest and the highest acceleration intensities amounted to 35 per cent, as compared with a similar drop-equalizer truck with the conventional bolster arrangement; the reduction was somewhat greater in the intermediate range of acceleration rates. The improvement on the triple-



A record of progressive deterioration of elliptic spring conditions following greasing and of the improvement effected by spring covers

bolster truck, particularly in the higher rates of acceleration, was considerably greater.

The effect of spring lubrication is shown in one of the graphs in which the number of shocks per trip at each acceleration intensity are plotted for each trip during an entire series of tests. It will be noted that the number of shocks in which the acceleration reached 15 per cent of gravity, while small, definitely progressed upward after the greasing on April 4, 1939. The springs were again greased and the covers applied on August 10. Following this date the number of shocks dropped and remained fairly constant to the end of the tests. Much



One of the pendulum-mounted lateral accelerometers

the same relative effect is also shown for accelerations of 12½, 10 and 7½ per cent of gravity, respectively. In the case of accelerations of 12½ and 10 per cent of gravity, the reduction following the greasing and covering of the springs amounted to considerably more than 50 per cent. In the case of the accelerations at the rate of 5 per cent of gravity, of which the number is several thousand per trip, the effect of the greasing and covering of the springs was relatively much smaller, probably because the roughness of the old spring plates, used in this test, created a friction threshold high enough to restrain the spring movement at low acceleration rates.

Three Arrangements of Bolster Links

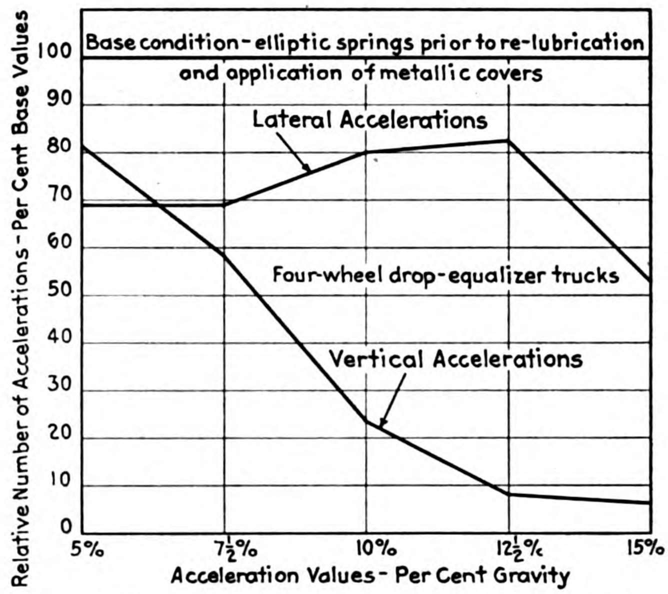
In developing the thrust-link positioning of the bolster three arrangements were tested. In the first, two thrust links were placed toward the same end of the truck, one attached to each end of the bolster and to the truck frame. In the diagram showing the forces in the links resulting from longitudinal thrust applied at the bolster center plate, it will be seen that the lateral components of the forces in the links, which develop when the bolster

is swung to either side of its center position, are unbalanced, tending further to exaggerate the lateral swing of the bolster and prevent it from centering freely.

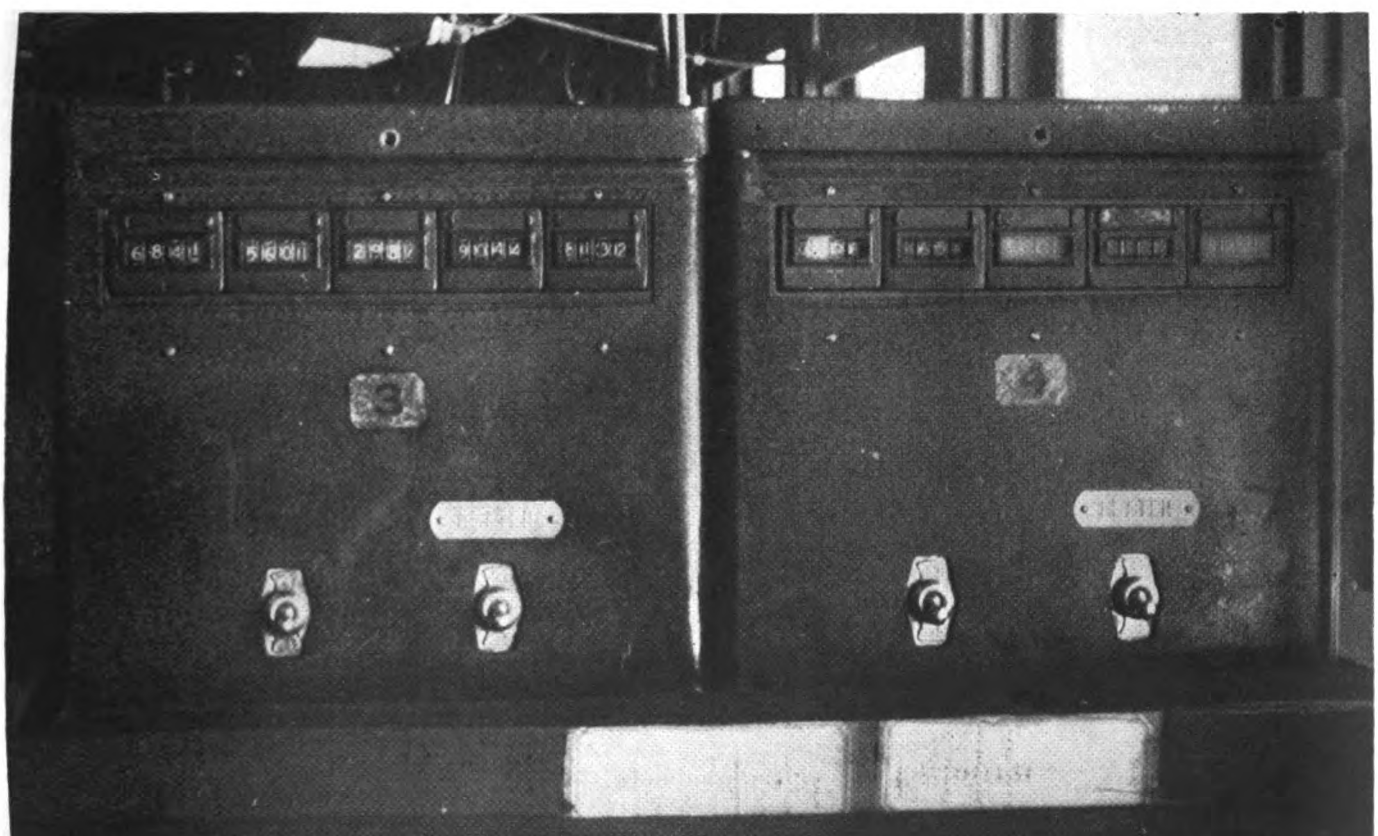
The second positioning arrangement to be tested utilized two thrust links on diagonally opposite corners of the truck. As shown in the diagram, the lateral components of the link thrust, when the bolster moves to either side of its center position, are in balance but there is a tendency to twist the bolster.

The third and final arrangement to be tested utilized four thrust links on each truck. With this arrangement not only are the lateral components of the thrust through the links balanced when the bolster is swung to either side of its center position, but both the lateral and vertical movements of the bolster are kept in a vertical plane on the transverse center line of the truck. To permit the foreshortening of the links required to accommodate the lateral displacement of the bolster, they are mounted in rubber at the truck-frame attachments. The rubber mountings serve the further purpose of insulating the bolster and car body from the high-frequency vibrations, including those in the sound range, which otherwise would be transmitted from the truck frames through the links. The links are tubular in form with universal joints welded on the ends, to permit full freedom of bolster action. The joints are of the heavy-duty automotive type produced in quantity for use in truck drive shafts. Sealed-in anti-friction bearings eliminate any friction drag which might otherwise be imposed by the links. The flange of the universal joint is bolted directly to the bolster lug, while at the other end the attachment is made through a calibrated rubber mounting, with two stages of compression to provide the required characteristic over the full range of longitudinal movement.

In one of the graphs are shown the comparative performances of these three methods of link positioning. Plotting the performance of the two-link arrangement with the links both placed toward the same end of the truck as the base performance over a range of acceleration intensities varying from 5 to 15 per cent of gravity, the relative performances of the other two arrangements are shown in terms of their ratio to the base condition at each acceleration value. It will be seen that the four thrust links show a decidedly smaller number of shocks than either of the other two through most of the range of acceleration intensities for which tests were made. Only in the case of the highest acceleration intensity do



The protection of the elliptic springs improves the lateral as well as the vertical ride



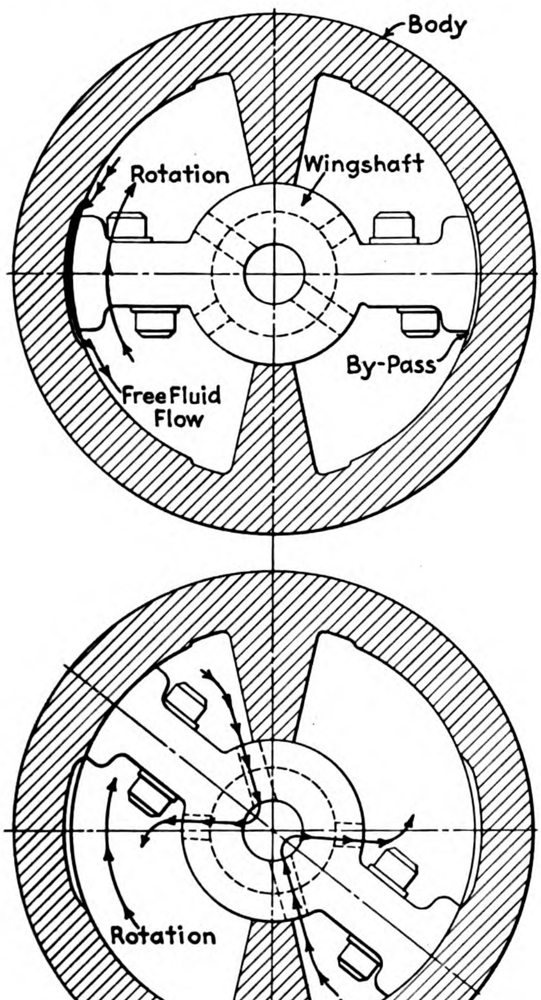
Each counter records the number of shocks at each of five rates of acceleration

the two links diagonally disposed approach the four-link arrangement in the smoothness of their performance.

The Variable-Resistance Hydraulic Energy Absorber

One of the photographs shows the Houdaille unit which has been specially developed to supplement the four-link positioners as a check on excessive lateral movement of the bolster. When it is in its normal or central position, the fluid can by-pass around the wing-shaft through a recess in the cylinder wall. This provides practically no restraint on the lateral movement of the bolster near its central position. Thus, the bolster hangers are free to perform their function of permitting the car body to ride forward undisturbed by lateral shocks of small displacement originating at the rail. As the lateral movement progresses, however, the by-passes are closed, and the hydraulic pressure then builds up, as shown in the sample indicator card, to cushion the effect of large centrifugal or other forces affecting the side motion of the car.

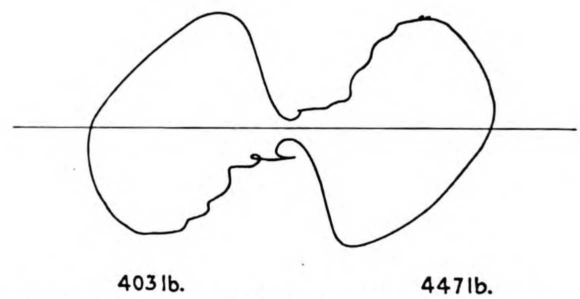
A new and essential feature is an indexing indicator which insures that the lever arm is properly located in its central position in relation to the by-pass. As shown in the illustration, this consists of two pieces of small round stock, one of which is welded to the movable lever and the other to the base of the unit. When the ends of these pieces are directly opposite each other,



A section through the Houdaille variable-resistance hydraulic energy absorber

the device is in its central position and the by-passes are at maximum opening.

The shaft seal in this unit was especially designed for railroad applications. As can be seen from the cross-sectional illustration, there is a spring arrangement which

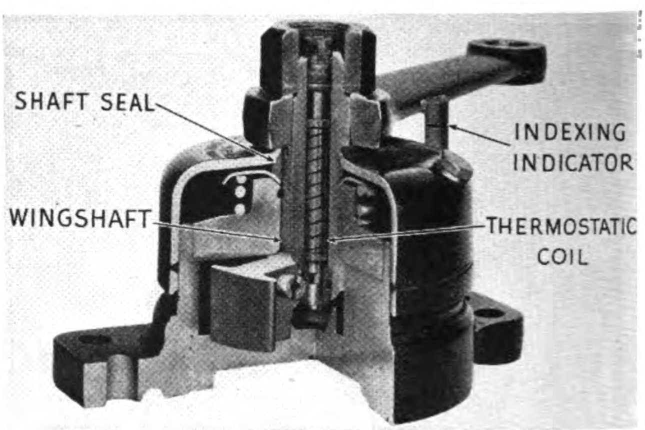


Indicator card of the Houdaille variable-resistance hydraulic energy absorber

maintains a constant pressure on the packing against the shaft. The center stem incorporates a thermostatic coil which automatically keeps the valve in proper adjustment to compensate for any fluid viscosity changes due to temperature variations.

Bolster Spring Covers

The bolster spring covers, employed to insure unimpaired freedom of action of elliptic bolster springs, are similar in principle to those in universal automotive use. These covers are made of No. 24 gage terne plate, which



Sectional view of the Houdaille hydraulic energy absorber

is considerably heavier than that used in automotive practice.

In installing these covers the springs are first thoroughly covered with grease, and canvas pieces wrapped around them. The telescopic bottom and side covers are then installed and the continuous top cover snapped in place over the flanges of the sides. The joint is then permanently closed by crimping. Holes for the insertion of a grease gun are provided for convenient addition of lubricant when desired.

The four-unit bolster link assemblies, supplemented by the variable-resistance Houdaille hydraulic energy absorbers, and the elliptic spring covers have been placed on the market through an arrangement with E. A. Lundy, Inc., 420 Lexington Ave., New York, as a means of effecting permanent improvement both in the lateral and vertical riding qualities of conventional passenger-car trucks. Trucks so equipped are now in service under certain cars operating on the New York Central and on the Pennsylvania.

Union Pacific Gets 20 More

4-6-6-4 Steam Locomotives

The third order of this wheel arrangement since 1936—The new locomotives have a higher boiler pressure and smaller cylinders—There are 14 wheels on the tender

THE last of an order for 20 single-expansion 4-6-6-4 articulated steam locomotives has recently been delivered to the Union Pacific by the American Locomotive Company. The road now has a fleet of 60 of these locomotives. Fifteen—the first of this particular wheel arrangement—were delivered in mid-summer 1936 and 25 more a year later. Those locomotives carried 255 lb. boiler pressure and had 22-in. cylinders. All three orders develop the same tractive force.

This 4-6-6-4 type, designed by Otto Jabelmann, vice-president of the Union Pacific, in cooperation with the American Locomotive Company to operate in high-speed freight service in mountain territory, has rapidly received country-wide recognition. To date, the American Locomotive Company has built, or has on order, 155 of this type locomotive for six different roads.

The last order of 20 locomotives recently delivered to the Union Pacific were specified to be capable of operating continuously under maximum horsepower output up to 70 m.p.h., to operate on grades of 3 per cent, and to pass curves of 20 deg. They have cylinders 21 in. in diameter by 32-stroke, 69-in. driving wheels, and carry a boiler pressure of 280 lb. per sq. in. which produces a calculated tractive force of 97,350 lb.

The weight on each driving axle was limited to 67,500 lb. and the total weight on drivers is 404,000 lb. The total weight of the locomotive is 627,000 lb., of which 101,000 lb. is carried on the leading truck and 122,000 lb. on the trailing truck. The weight of the tender, fully loaded, is 436,500 lb., making the combined maximum weight of the locomotive and tender 1,063,500 lb.

The Boiler and Frame Structure

The boiler was designed and manufactured with the utmost care. The grate and firebox were proportioned to burn soft coal having approximately 11,800 B.t.u. per pound. All boiler plates are of Bethloc steel deoxidized. Horizontal seams have a saw-tooth welt strap inside and a straight welt strap outside with all joints caulked inside and outside.

The Elesco Type E superheater of 90 units, 1⅜ in. diameter, has 177 4-in. No. 9 flues and 45 2¼-in. No. 12 flues. The tubes and flues are 20 ft. long and were furnished by the Republic Steel Company.

The firebox has a horizontal mud ring with large radii at the corners, and includes a combustion chamber 106 in. long. It has a grate area of 1322 sq. ft. and a heating surface of 500 sq. ft. Five Security circulators in the firebox, with none in the combustion chamber, furnish 81 sq. ft. additional heating surface and support an American brick arch. The grates are Firebar with 15 per cent air opening, and the coal is fed to them by a Standard MB type stoker with engine on the tender. Fire doors are Franklin Butterfly type. The boilers are equipped with the Electro-Chemical automatic blowdown and foam collapsing trough system and have Prime washout plugs and Wilson blow-off cocks. The staybolts are the Flannery KM welded type.

The boiler is fed by one Nathan live-steam injector located on the right side, capable of supplying the boiler under maximum horsepower output, and one Elesco Type TP exhaust steam injector of equal capacity located on the left side. The smokebox arrangement is the labyrinth type developed by the railroad company. The smoke stack is double and its extension is of the multiple flare type formed to act in cooperation with the four exhaust-nozzle jets also developed by the railroad company. A smoke deflector is fitted to the top of the double stack.

A water-circulating nozzle pointed toward the rear and operated by steam from the enginehouse steam line is located in the bottom of the first course near the front. This improves circulation when firing up a cold boiler producing a more even temperature throughout, thus reducing stresses due to expansion.

Both the front and back engine units are equipped

with General Steel Castings Corporation frame beds with cylinders, including back cylinder heads, cast integrally. The articulation hinge comprises a tongue cast on the rear of the front engine-bed unit, fitting into a cavity in the front of the rear engine-bed unit. Bushings for the articulation pin are made in step sizes so that renewals can be made without disconnecting the front engine, and force-feed lubrication is provided. Part of the weight of the rear engine unit is transmitted to the front engine units since it rests on top of the articulation hinge tongue. By transmitting the weight of the boiler at two points on the front frame structure—namely, the main boiler bearing and the articulation hinge—perfect stability of the front frame structure is afforded. This requires, however, that the spring rigging must be built with maximum flexibility and engine truck equalized with the spring suspension of the front engine units.

The Running Gear

The driving wheels are of the Alco Boxpok type. The main wheels are the rear pair on each unit and are the only pairs which are cross-counterbalanced. The reciprocating weights on each side of the locomotive amount to 1,656 lb. on the front engine and 1,517 lb. on the rear engine. Twenty-five per cent of these weights are balancing, giving a reciprocating overbalance of 138 lb. in each driving wheel on the front engine and 126 lb. in each driving wheel on the rear engine.

These locomotives have incorporated in their design the "lever principle" developed by the builders, which comprises correctly established engine-truck and trailing-truck lateral resistance together with lateral-motion devices on the first and second pairs of drivers of each group, which permit the units when curving to pivot on the back pair of drivers and so to enter and pass through curves with a lever action. The use of this principle, together with ample flexibility in the spring rigging, greatly reduces all wheel binding, and by reducing lateral stresses greatly prolongs the life both of the locomotive structure and of the track.

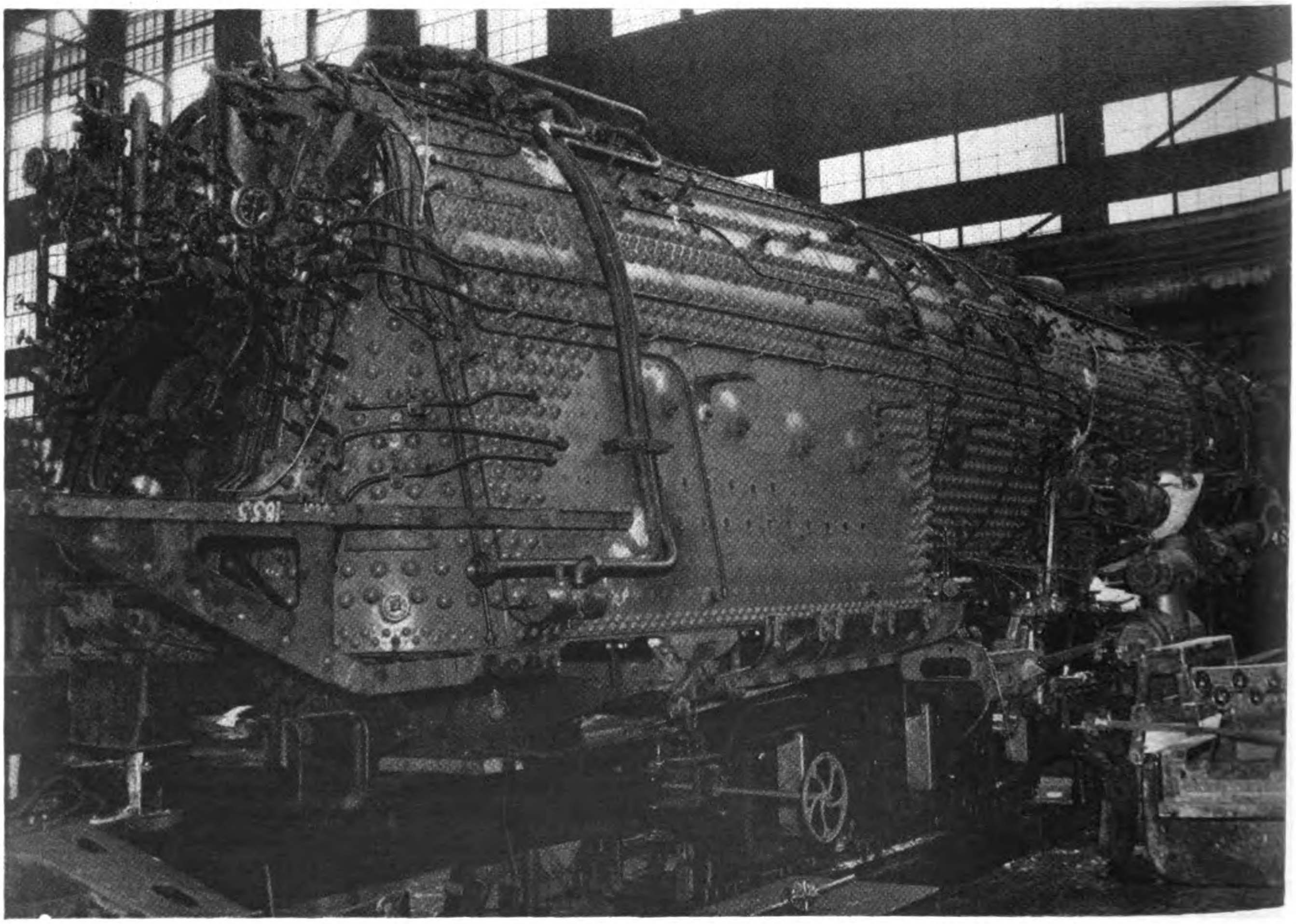
The main driving axles are of low-carbon nickel steel, while the others are straight carbon steel, all hollow bored, and equipped with Timken roller bearings.

Alco geared roller centering-device engine trucks are used with SKF non-self-aligning roller bearings. The center plate is sealed against the entrance of dirt and is lubricated by force feed. Force-feed lubrication is also applied to the teeth of the geared rollers. The trailer truck is of the General Steel Castings Corporation four-wheel radial type, both wheel and axle units being of the same size and equipped with SKF roller bearings.

Frame pedestal shoes are of hard bronze, while the wedges are of forged steel with a bronze lining on the pedestal face. Franklin automatic compensators and snubbers are applied to all wedges.

The pistons are the Locomotive Finished Material Company's light-weight, rolled-alloy-steel three-ring design. Cylinder and piston-valve bushings are of Hunt-Spiller gun-iron especially hardened. Paxton-Mitchell rod packing is used.

Crossheads and guides are of the multiple-bearing type. Instead of rigid bolted fastenings at their ends, the guides are clamped in position by means of the Alco Slidguide device, which permits of sufficient flexibility longitudinally to prevent distortion. Main and side rods are of low-carbon nickel-steel with channeled eyes. Side



In the erecting shop—The boiler ready for the lagging

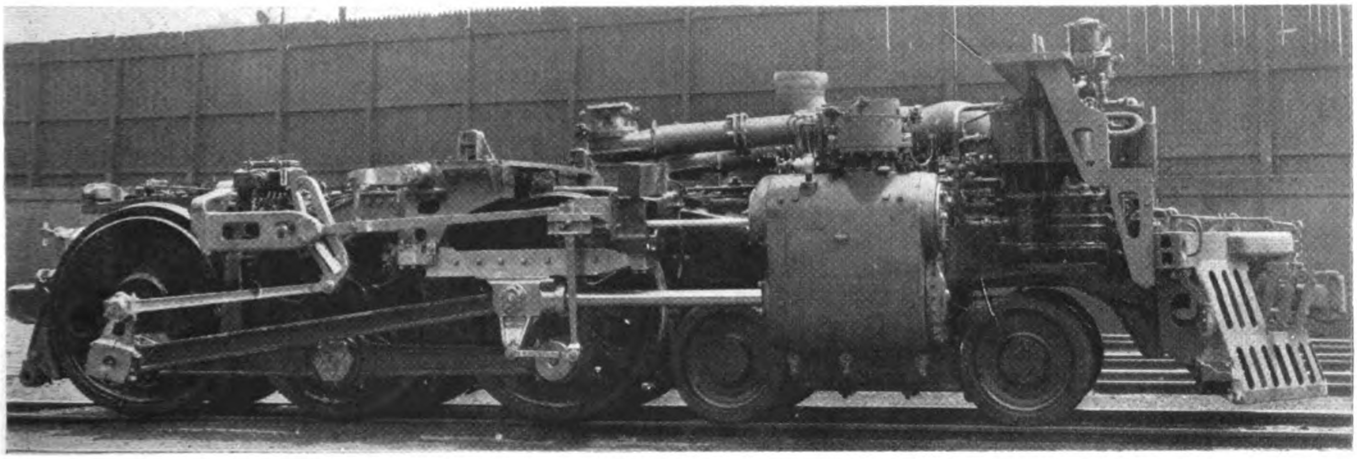
rods are of articulated design without knuckle pins. All crank pins, except the front, are provided with Prime Alemite hard-grease fittings for internal lubrication. Main- and side-rod bushings are of Magnus bronze.

Walschaert valve gear is used with trunnion links and special lightweight eccentric cranks attached to the main pins with two bolts each. McGill needle bearings are applied throughout the valve gears except at the rear ends of the eccentric rods, which take an SKF self-aligning roller bearing. An Alco type H reverse gear with 12-in. diameter cylinder and 24-in. stroke is connected to the reverse shaft arm of the rear engine unit. The piston valves are 12 in. in diameter, of lightweight design, and are fitted with Hunt-Spiller Duplex bronze and cast iron, lip type packing rings.

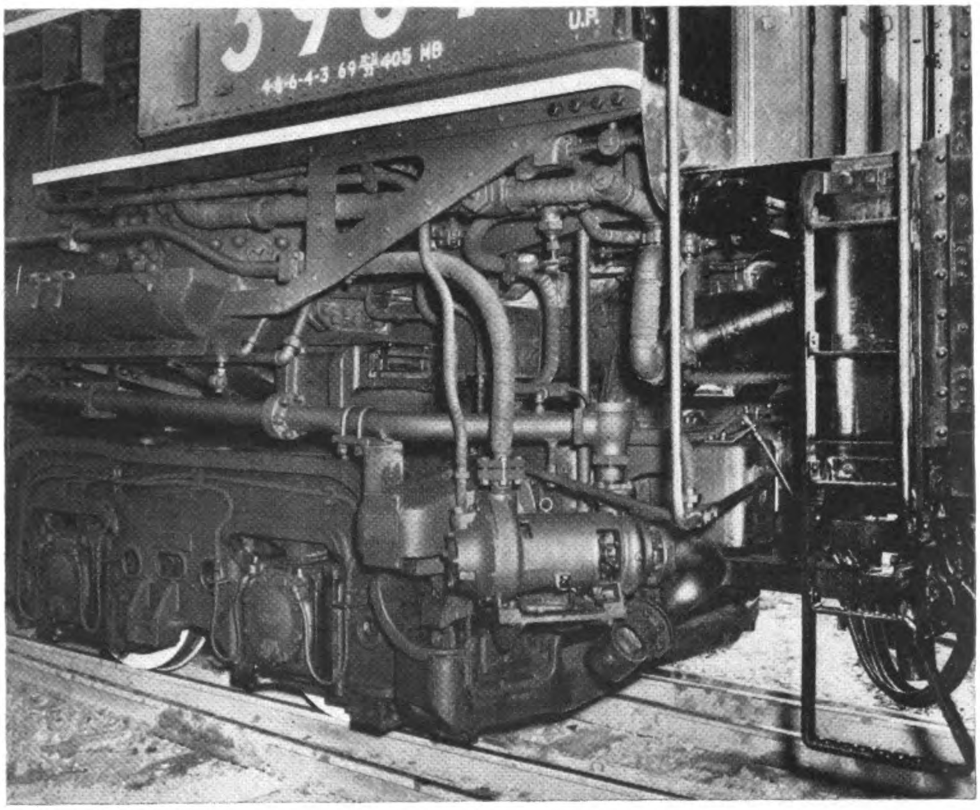
Great care was used in proportioning the areas of all steam and exhaust passages. The system of steam pipes employed has been developed by the builders for articulated locomotives with the idea of providing for all necessary movements, but requiring a minimum of maintenance. Steam pipes to the front cylinders are of the jack-knife design hinged on semi-ball joints, all alike and exerting no spreading pressure. Metallic packing is used everywhere except in the slip joints in the rear cylinder steam pipes. These slip joints are ported so as to be perfectlly balanced against the effect of internal pressure. The exhaust pipes from the rear cylinders extend forward and join under the base of the rear exhaust stand, while the single exhaust pipe from the front cylinders has the usual ball joints front and rear with a ring-packed slip joint. Steam enters the drypipe through an Elesco Tangential dryer.

The Spring Rigging

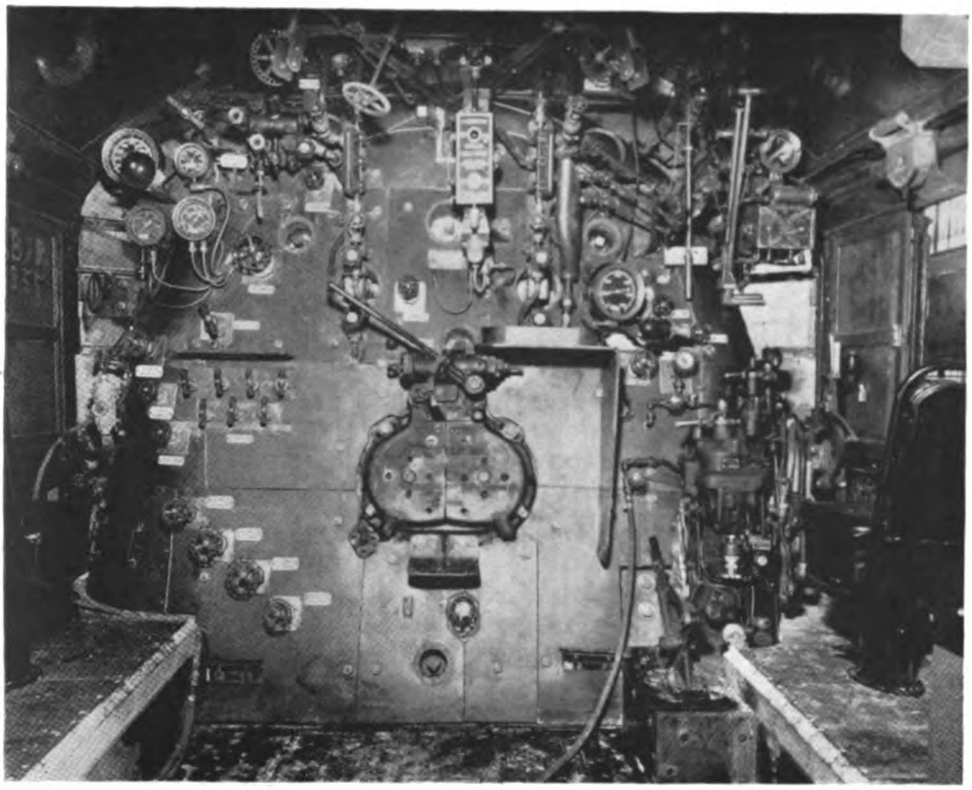
The engine truck employs parallel spring suspension wherein one-third of the load is carried on semi-elliptic springs and the remaining two-thirds on coil springs. A shallower and, therefore, more flexible semi-elliptic spring is thus obtained and serves as a damping spring, while the initial shocks are absorbed by the coils. This



A complete front engine unit



The cab is supported directly from the boiler—. In the lower foreground is the centrifugal pump portion of the Elesco type TP exhaust-steam injector



The back boiler head presents an orderly appearance

parallel type of spring suspension greatly improves riding.

The driving springs are all seated on rollers. Cushioning coil springs are located at the dead ends of the equalization system on both engine units at the bottom end of the rear trailer-truck spring hanger and between the engine-truck equalizer and the front cross equalizer. Wherever possible, loop-type spring hangers are used. Load-carrying spring-rigging pins are reduced to a minimum, but where they would commonly be employed at the joints between equalizers and spring hangers blocks of Gatke Grafitex are inserted. This same material is used for the few pin bushings employed.

Lubrication

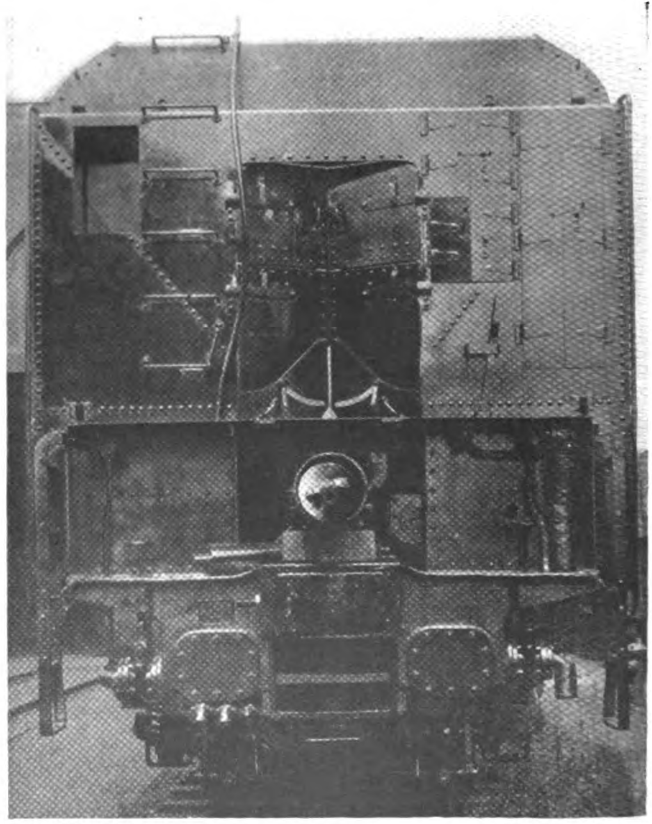
Each locomotive is equipped with four Nathan mechanical force-feed lubricators of 30 pints' capacity. Two of these are used for the lubrication of the guides, driving-box shoe and wedge faces, trailing-truck pedestals, articulation hinge in, engine-truck center castings, trailer-truck center plate, radial buffer, power-reverse gear and intermediate reach-rod crosshead. The other two lubricators are used to lubricate the cylinders, valves, steam-pipe joints, throttle, stoker, piston-rod glands, boiler bearing, and front exhaust-pipe slip joint. Alemite soft-grease fittings are employed on the valve motion, brake rigging and throttle rigging.

The Cab

The cab is supported entirely from the boiler by a construction perfected by the builder, in which the cab travels with the expansion of the boiler and has no connection with the frame whatsoever. The railroad company's design of rear closure, consisting of four folding doors, is used.

The Pilot and Bumper

The pilot is cast integral with the front bumper beam. Its top section consists of a swing-type coupler which, when in closed position, fits the contour of the pilot and



The front end of the tender

removes all obstructions. This design was also used on the 4-8-4 type locomotives built for this railroad.

Brakes

Brake-operating equipment is New York Schedule 8-ET with KM vent valves on both the locomotive and tender. Two $8\frac{1}{2}$-in. cross-compound air compressors

Principal Dimensions Weights and Proportions of the Union Pacific 4-6-6-4 Type Locomotives

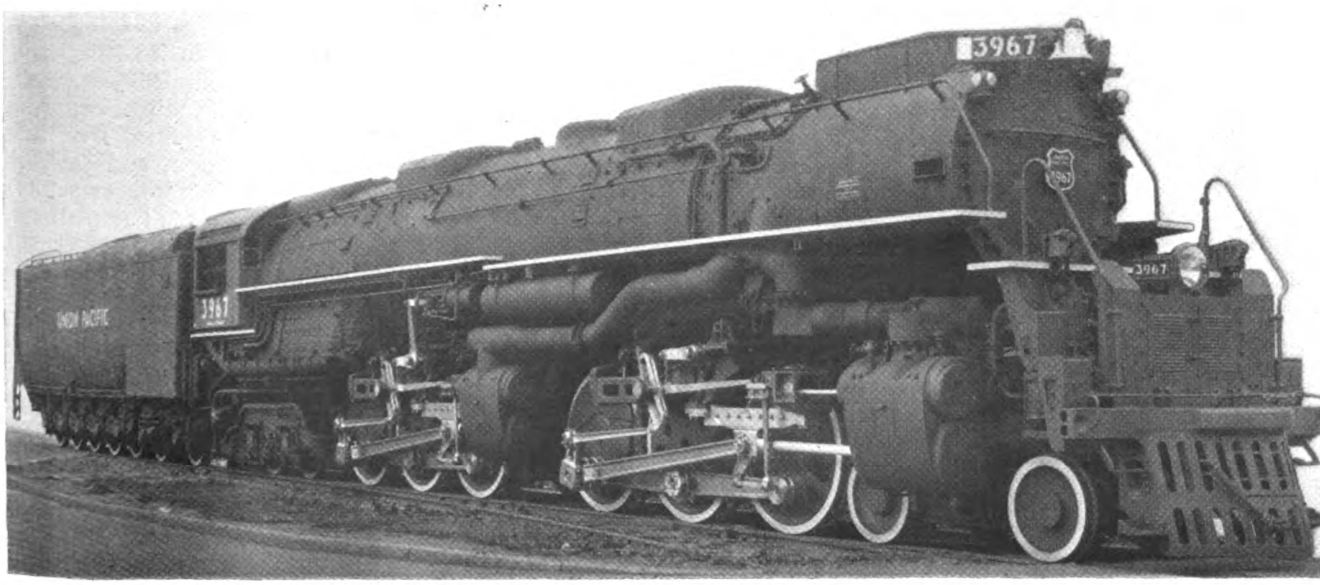
Railroad	Union Pacific
Builder	American Loco. Co.
Type of locomotive	4-6-6-4
Road numbers	3950-69
Date built	1942
Service	Freight
Height to top of stack, ft.-in.	16-2½
Weights in working order, lb.:	
On drivers	404,000
On front truck	101,000
On trailing truck	122,000
Total engine	627,000
Tender (two-thirds loaded)	348,500
Wheel bases, ft.-in.:	
Driving	12-2
Engine, total	60-4½
Engine and tender, total	106-8
Wheels, diameter outside tires, in.:	
Driving	69
Front truck	36
Trailing truck	42
Engine:	
Cylinders, number diameter and stroke, in.	2—21 x 32
Valves, piston type, size, in.	12
Maximum travel, in.	7
Steam lap, in.	1⅜
Exhaust clearance, in.	⅛
Lead, in.	¼
Boiler:	
Type	Straight top
Steam pressure, lb. per sq. in.	280
Diameter, first ring, inside, in.	94 11/16
Firebox, length inside, in.	187 1/32
Firebox, width inside, in.	108 3/16
Combustion chamber length, in.	106
Circulators, number	5
Tubes, number and diameter, in.	45-2¼
Flues, number and diameter, in.	177-4
Boiler (continued):	
Length over tube sheets, ft.-in.	20-0
Grate area, sq. ft.	132.2
Heating surfaces, sq. ft.:	
Firebox and comb. chamber	500
Circulators	81
Firebox, total	581
Tubes and flues	4,214
Evaporative	4,795
Superheater	2,162
Comb. evap. and superheater	6,957
Tender:	
Type	Water bottom
Water capacity, gal.	25,000
Fuel capacity, tons	28
Trucks	1—4-wheel—5 axles in pedestal
Rated tractive force engine, 81 per cent, lb.	97,350
Weight proportions:	
Weight on drivers ÷ weight engine, per cent	64.43
Weight on drivers ÷ tractive force	4.15
Weight of engine ÷ evap. heating surface	130.80
Weight of engine ÷ comb. heating surface	88.08
Boiler proportions:	
Firebox heating surface per cent comb. heating surface	7.19
Tube-flue heating surface per cent comb. heating surface	60.57
Superheater heating surface per cent comb. heating surface	31.07
Firebox heating surface ÷ grate area	3.78
Tube-flue heating surface ÷ grate area	31.87
Superheater heating surface ÷ grate area	16.35
Comb. heating surface ÷ grate area	52.61
Evaporative heating surface ÷ grate area	36.27
Tractive force ÷ grate area	736.30
Tractive force ÷ evaporative heating surface	2.03
Tractive force ÷ combined heating surface	14.00
Tractive force × diameter drivers ÷ comb. heating surface	965.60

are mounted on the frame at the front end and are operated by superheated steam. Finned type radiators are used in the cooling system. Neither the engine truck nor the trailer truck is fitted with brakes, but the engine truck is designed for their possible future application.

Tender

The tenders have a water capacity of 25,000 gallons and a coal capacity of 28 tons. They are built on General Steel Castings Corporation water-bottom beds, carried at the front on a four-wheel center-bearing truck back of which are five pairs of wheels mounted in pedestals cast integral with the tender bed. All wheels are 42 in. in diameter and have Timken roller bearings in outside journal boxes. The four-wheel truck is equalized and the boxes in the frame pedestals are equalized together on each side to form a three-point load suspension. Over each frame pedestal box is a single semi-elliptic spring and two coil springs. The front and back ends of each equalizing system are anchored to the bed casting through tandem coil springs. On top of each frame pedestal box and under the semi-elliptic spring is fitted a General Steel Casting Corporation centering device made up of rubber blocks sandwiched between steel plates. The upper ends of these devices are guided to prevent lateral movement, but their lower ends can move laterally with the boxes against the shear resistance of the rubber. Lateral movement of the rear boxes is restricted to less than that on the other boxes.

Between the engine and tender there is a Franklin E-2 radial buffer. Flexible joints between engine and tender for the stoker are Barco, while those for the steam-heat line are Franklin. Brake conduits are U. S. Rubber armored hose. Tank values are 4-in. gate type and suction hose is Hewitt Rubber, 4½ in. diameter. At the rear end is a Miner type A 94XB draft gear and a National AAR Type E coupler, 6½-in. by 8-in. swivel butt, double-rotary, bottom operated. The tender frames are arranged for the future application of buffer mechanism at the rear end.

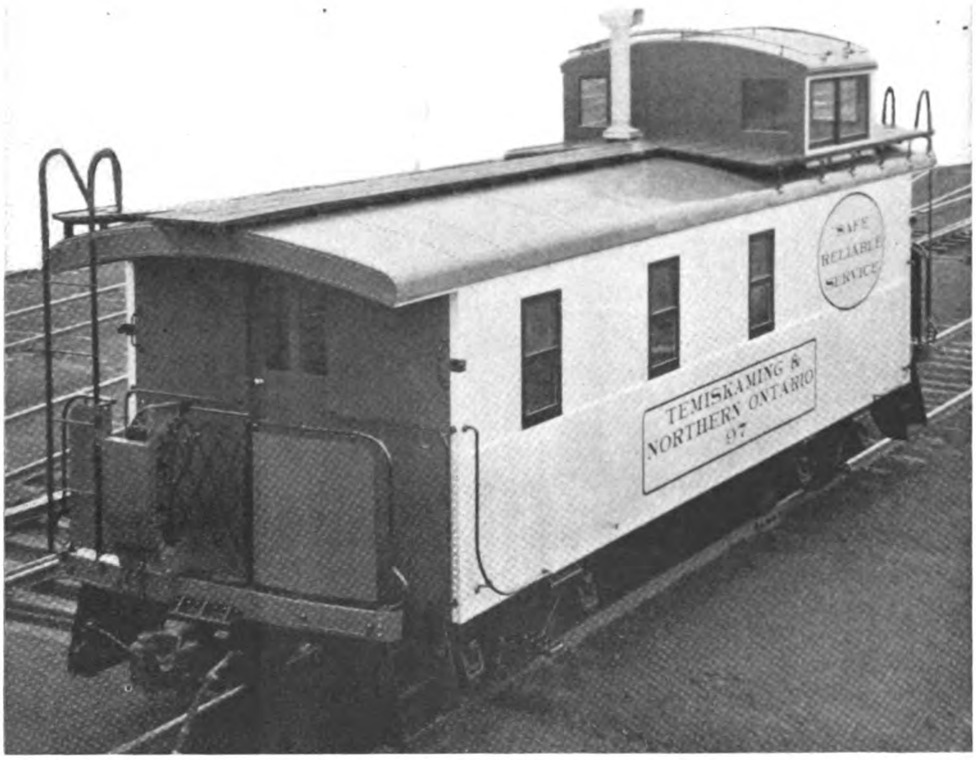


T. & N. O. Caboose

THE Temiskaming & Northern Ontario now has in service eight all-steel, wood-lined caboose cars of an unusual design which were built by the National Steel Car Corporation, Hamilton, Ont. The overall length of the cars, over pulling faces of the couplers, is 38 ft. and the light weight is 50,000 lb.

The underframe has a center sill consisting of two 12-in. wide by 3/8-in. thick web plates, two top outer angles 3½ in. by 3½ in. by 3/8 in., four bottom angles (two inner and two outer) 3½ in. by 3½ in. by 3/8 in. and a top cover plate 21 in. wide by 3/8 in. thick, the whole being riveted together. The depth of the box-like structure is 12⅞ in. The remainder of the underframe is a departure from the more conventional type of caboose car underframe. The floor is supported on 5-in. 10-lb. I beams, spaced about 37-in. centers and running transversely. These supports rest on top of the center sills, to which they are welded. Each side sill consists of a 7-in., 9.8-lb. channel to which is riveted, by one flange, a 3-in., 5.1-lb. Z, the other flange of the Z forming the face for the riveting of the ⅛-in. thick steel side sheathing. By the use of the transverse I-beams, cross-bearers are eliminated. The entire underframing is covered with 1/16-in. thick steel sheets supported on and welded to the I beams. Cemented to this floor sheet is a layer of Johns-Manville waterproof felt bedded in plastic. Six wooden floor nailing strips, 1⅝ in. thick by 3 in. wide, and bolted to the I beams, run full length of the car. Between these strips, two ¾-in. thick layers of Johns-Manville Hairinsul are laid. A 1-in. thick wood floor is then laid diagonally. A layer of waterproof felt, laid in plastic, is applied prior to the laying of the top longitudinal, ¾-in. thick floor.

The bolsters, fabricated by riveting, consist of a bottom cover plate 3/8 in. thick, measuring 24 in. wide at the center sills and 18 in. wide at the side sills, with a top cover plate 3/8 in. thick, 18 in. wide. Bolster diaphragms of 14-in. plate are spaced 12 in. back to back. The bolster-center-sill separator is cast steel, with extended side arms front and back, the tops of which are flanged inward to form an additional support at the top cover plate. All bearing surfaces are accurately machined to insure correct and proper fitting at the bearing surfaces. The center plates are A. A. R. standard design. The front and back draft stops are steel castings and the bearing surfaces are machined.



T. & N. O. all-steel caboose

The body end sill is made up of a 7-in. 16.4-lb. channel, with a top cover plate 5/16-in. thick by 10½-in. wide, extending the full width of the car. The platform and end sill consists of a 7-in. 16.4-lb. channel, the back forming the outer face, with top, bottom and back of ¼-in. plate, the whole forming a box-like structure. Two pressed steel caps close in the ends. The platform side sills are 6-in. 8.2-lb. channels. Other center sill separators are made of 3/16-in. plate pressings.

The side posts are 3-in. 5.1-lb. Z-bars, 11 on each side. Each of the four corner and end posts is a 4-in. 8.2-lb. Z. The roof carlines of the body and cupola are angles formed on a radius.

The outside sheathing of the body and cupola is ⅛-in. thick copper-bearing steel, and the roof sheets are No. 14 gage steel riveted to the carlines.

Inside wood sheathing 13/16-in. thick by 2¼-in. face tongue-and-grooved with small V, is blind-nailed to wood nailing strips which are bolted to side posts and end posts. The ceiling is finished in a like manner.

Principal Dimensions and Weights of the T. & N. O. Caboose Cars

Length over pulling faces of couplers, ft.-in.	38- 0
Length over platform end sills, ft.-in.	34- 8¼
Length, inside (body), ft.-in.	28- 4⅜
Width over eaves (body), ft.-in.	9- 8⅝
Width inside, ft.-in.	8-10
Length inside cupola, ft.-in.	5- 5⅞
Width over cupola eaves, ft.-in.	8-10⅝
Width, inside cupola, ft.-in.	8- 2½
Height, rail to center of coupler knuckle, ft.-in.	2-10½
Height, rail to top of floor (body), ft.-in.	4- 1¾
Height, rail to running boards (body), ft.-in.	12- ¾
Height, rail to top of cupola, ft.-in.	15- 3
Height, floor to ceiling (body), ft.-in.	7- 4½
Truck centers, ft.-in.	19-10
Wheel base, ft.-in.	5- 6
Wheel diameter, in.	33
Type of wheel	Cast iron
Journal size, in.	5 x 9
Light weight, lb.	50,000

There is no metal contact from the exterior to the interior, thus, frost from the outside cannot be transferred to the inside of the caboose. Before the inside nailing strips and wood lining are applied, the entire interior metal surfaces are coated with plastic, and while wet, a complete layer or covering of waterproof felt is applied, thus, no bare metal is visible from the interior of the caboose. The space between the posts and carlines is filled with a layer of 1-in. thick Salamander. The insulation at the side sill recesses has been kept 2 in. from the bottom of the side sill, thus forming a gutter for catching moisture. Two ⅝-in. holes, drilled in the bottom of each side sill and end sill, in the space between each side post and each end post, drain off any accumulation of moisture. Further, these holes afford circulation of air which assists in keeping insulation dry.

The seats and seat backs, of wood construction, forming the lower berth, slide forward forming a support for the mattress. When in normal closed position, the space under the seat provides a locker for the bed linen, the seat forming the hinged cover. The upper berths of metal are raised and lowered according to requirements. All mattresses are 4 in. thick, 30 in. wide and 6 ft. long. A step ladder affords access to each upper berth. Adjoining each berth section is a metal locker.

Adjoining the conductor's locker, a desk arrangement is located, with ample drawer space below and compartment space above. Next in line is the metal coal box holding about 550 lb. of coal, the inside being arranged to feed coal to the door.

The latest type of caboose stove, thoroughly insulated walls, ceiling and floor provide a safe and convenient place for cooking. Under the cupola floor, on this side of the caboose, is storage space. Next, the adjoining locker at the end of the caboose is a metal-lined dope, oil and service supply locker. Under the cupola floor is a white enameled metal refrigerator.

Adjoining the cupola partition is a stainless-steel corner type wash basin, above which is a water cooler of stainless-steel.

The sliding side windows of the cupola are large, eliminating dead vision spots. Each half of the cupola contains a reversible seat. The inner sash of the end cupola windows are sealed; the outer sash, hinged.

As a safety measure, the platform railing has been increased to 3 ft. 8 in. from the top of the platform floor, with a light-weight folding tail gate and additional self-locking safety bar adding further safety for the crew.

Welded platform steps, of the passenger-car type, with 1 in. thick oak treads secured to the metal step treads, provide safe footing. The height from the rail to the top of the bottom tread is only 14½ in. instead of the usual 18 in. A vertical handwheel-operated power brake is located at the platform railing at each end of the car.

The running boards are of wood, 1⅛ in. thick by 7½ in. face, mounted on metal saddles riveted to the roof.

The trucks have Symington 5-in. by 9-in. cast-steel truck sides with lateral-motion roller-type bolster; Symington resilient-type side bearings; double elliptic springs and cast-iron wheels 33 in. diameter. The cabooses are equipped with Westinghouse AB brakes.

The exterior sides of the cabooses are finished in Dulux aluminum upon which in a golden yellow panel, with black border, appear the name of the road and caboose number in black. Similar treatment is afforded the worded slogan which appears in an oval-shaped design about the center of the cupola. The platform railing ends and ends of the cupola are signal red; the underframe and trucks, black.

The interior walls, doors, and other equipment are light blue-grey; the ceilings cream, and floor terra cotta red.

The interior is designed for maximum comfort and convenience

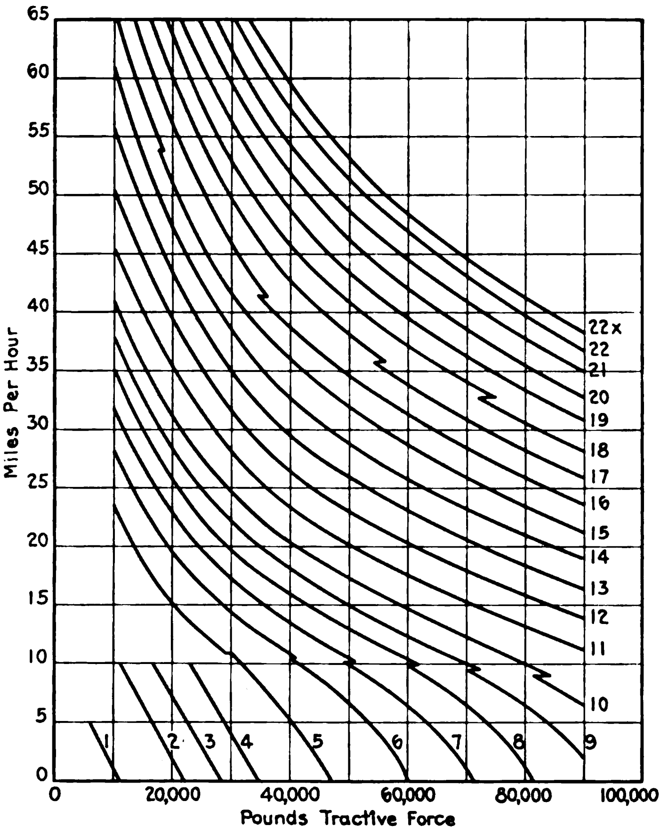
The New Haven's Latest

A. C. Electric Locomotives

By Charles Kerr, Jr.* and F. L. Alben*

Designed for freight service they can be used also for hauling heavy passenger trains between New York and New Haven

THE New York, New Haven, and Hartford Railroad has recently placed in service three of five Westinghouse a.c. electric freight locomotives, road numbers 0150-0154. These will handle 5,000-ton trains (125 cars) in either direction between the New York terminals and New Haven. They are primarily intended for freight service, but are occasionally employed as passenger power. In this service they handle 20-car trains between New York (Pennsylvania Station) and New Haven.



Locomotive performance curve showing 22 main running combinations

The principal features of the locomotives are indicated in the table.

Locomotive Cab

The locomotives are streamlined according to the latest New Haven practice. Added safety is assured the crews by having the operating compartment set back from the ends about eight feet. The entire cab, which carries all equipment except the propulsion motors, is carried upon the main trucks on center-pins and spring loaded sliding supports. A bridge truss extends along each side to furnish sufficient strength in the cab structure, especially for lifting at the ends. The side sheets were formed over metal shapes, fitted and welded; the seams are then ground to give a one-piece smooth appearance. For ready access to the equipment housed in the cab, three removable hatches are placed in the roof. The end hoods are also removable.

There are doors at each end of the cab, and also two on each side. The engineer's compartment can thus be reached either from the sides or the ends. The interior consists of several compartments. The end hoods house small apparatus, such as compressors, cab signals, battery, etc. Next are the engineer's or operating compartments which are heavily insulated for comfort under extreme weather conditions. The central portion houses the main control apparatus, blowers, transformers, etc. In this main central compartment, the 11,000-volt apparatus is further isolated into a compartment.

Approximately 50,000 c.f.m. of ventilating air is required for the apparatus. The blower intake is through grilles in the side of the cab. The discharge from the blowers is taken to the motors and transformer through a duct along the bottom of the cab. Sand boxes, four per side, are built into the sides of the cab and can be filled either from the inside or the outside of the cab. There are also a number of special features built into the cabs, such as defrosters, window wipers, rain gutters, water drains and built-in steps for access to the roof equipment. Engineer's side windows are of the double sliding type, while the front windows are fixed, the glass being shatterproof and easily removable.

The cab is designed for the future addition of train heating equipment, including boiler, water tanks and fuel tanks. As a freight locomotive, in the absence of the train heating apparatus, 53,000 lb. of ballast is carried in the form of steel slabs bolted into place.

Running Gear

The running gear consists of two main integral cast steel frames mounted on two 4-wheel guiding trucks and six pairs of driving wheels. The two main frame castings are connected by a ball, socket and pin articulated joint through which the entire tractive force of the locomotive is transmitted. The centerpins which carry the cab are located ahead of the first pair and back of the last pair of drivers, which permits a short rigid driving wheel base, enabling the locomotive to negotiate a 20 deg. curve. In addition to the center-pins, there are two spring loaded cab supports on each main frame which carry 40 per cent of the cab weight and provide for the proper weight distribution at the rail.

The main and guiding truck frames were supplied by the General Steel Castings Corporation and are of integral cast steel construction; all wearing surfaces are protected by hardened plates and bushings which can be easily renewed when necessary.

Each main truck frame is supported on a three-point

* Transportation Engineers, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

equalization system. The three driving axles in each main frame are equalized together on each side furnishing two points of support for the frame, while the third point is supported by the guiding truck center-pin, thereby providing stability for the locomotive in the horizontal plane. The spring rigging follows existing practice of the railroad. This practice incorporates heavy coil springs which are placed between the semi-elliptic main springs and the journal boxes. All equalization pins have hardened bushing pins and Alemite fittings.

Principal Dimensions and Weights of the N. Y. N. H. & H. A. C. Electric Locomotives

Wheel arrangements	4 6+6-4
Weight, lb.:	
On drivers	360,000
Per driving axle	60,000
On trucks	140,000
Per truck axle	35,000
Total	500,000
Wheel bases, ft.-in.:	
Total	69
Driving	37-4
Rigid	13-8
Length over couplers, ft.	80
Length, cab, ft.	76
Width cab, ft.	10
Height over locked down pantograph, ft.	15
Wheel diameter, in.	
Driving	57
Guiding	36
Maximum tractive force, 25 per cent adhesion, lb.	90,000
Maximum horsepower	9,100
Speed at maximum horsepower, m.p.h.	38
Tractive force at maximum horsepower, lb.	90,000
Continuous hp. at 65 m.p.h.	4,860
Continuous hp. at 39 m.p.h.	4,780

The main brake rigging is of the equalized outside-hung single-shoe type, schedule 14EL, designed to give 80 per cent braking power with 50 lb. brake cylinder pressure. Two UAD 16-in. by 12-in. cylinders are mounted on each main truck frame near the guiding trucks. Special care has been given to the brake system to insure accessibility for inspection and maintenance. The guiding truck brakes are of the clasp type using two 7-in. by 7-in. UAH Duplex brake cylinders per truck, furnishing 62 per cent braking power with 50 lb. cylinder pressure. All brake hangers are fitted with hardened bushings and pins. The shoes are spring balanced.

Guiding Trucks—Cab Restraint

The four-wheel guiding trucks of the equalized type have rockers with variable restraint. This restraint starts at 27½ per cent crack-off, increasing to 32½ per cent at 1½-in. truck swing, then dropping to 17 per cent of the center-pin load at full truck swing. A radius bar, spring restrained to 5,500 lb. is fitted to the inside of the truck frame to prevent oscillation of the truck around its center when operating at high speeds on tangent track, thus insuring smoother performance of the locomotive. When operating around curves, the load on the restraint spring decreases.

The cab restraint device is located at the center of the cab directly above the articulation of the main frames. It consists of a double cam spring loaded roller device with a spring set up of 4,000 lb. for each spring. It has been established from actual service that due to the accumulation of wear in the articulation parts, there is a tendency in an articulated locomotive to swivel the main trucks relative to the cab on tangent track when operating at high speeds, causing the locomotive to nose through the track clearance. This may become critical if the natural frequency of the locomotive is synchronized with the nosing period. The cab restraint device keeps the main trucks in line with the cab and eliminates this tendency to nose on tangent and relatively low degree curves, but permits freedom of movement without any restraint when operating on sharp curves. This device has given satisfactory performance for eight years.

Flexible Cup Drive

With the twin traction motors mounted rigidly to the main truck frame the Westinghouse flexible cup quill drive is used. This selection was based on satisfactory results obtained through long years of service with millions of miles of operation back of it. This drive per-

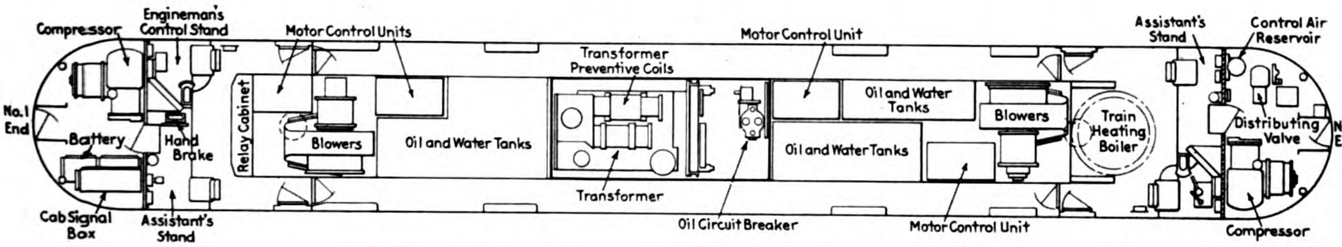
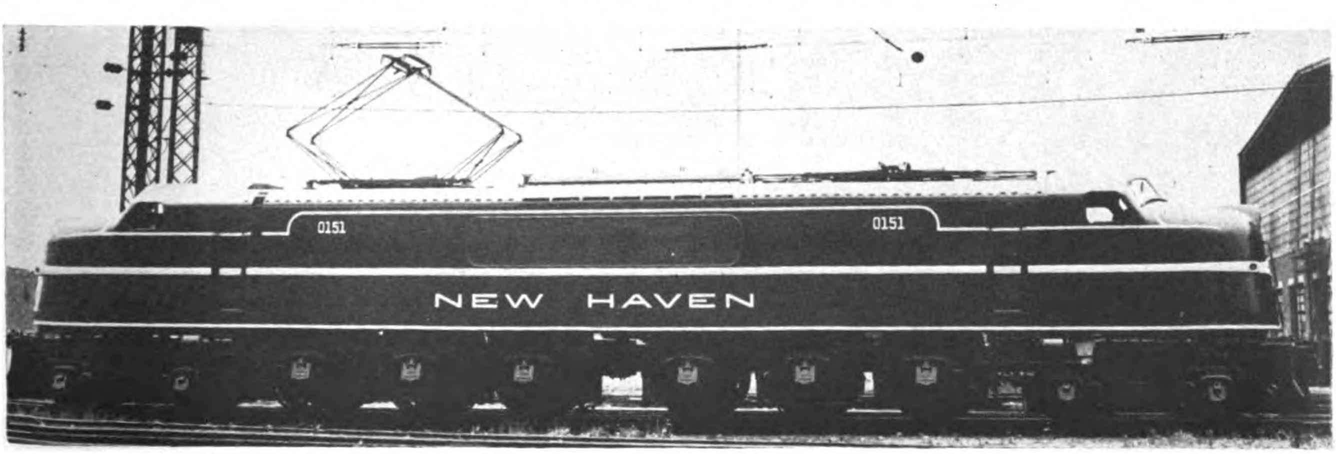


Diagram showing the arrangement of apparatus in the locomotive cab

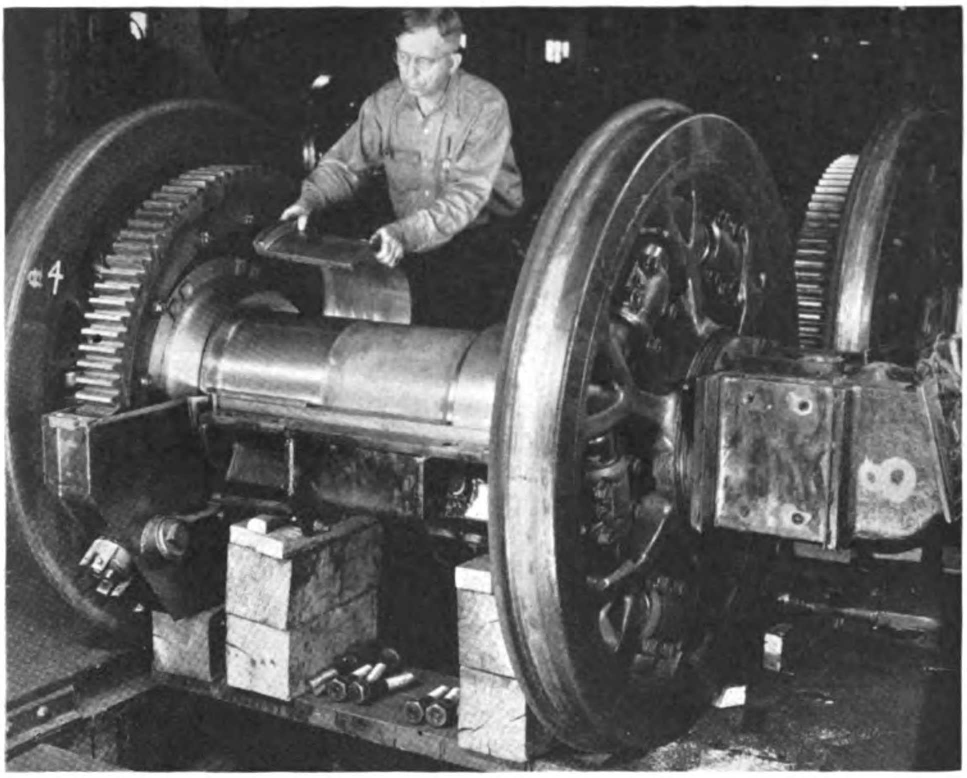


New York, New Haven & Hartford 11,000-volt a.c. freight locomotive built by Baldwin-Westinghouse

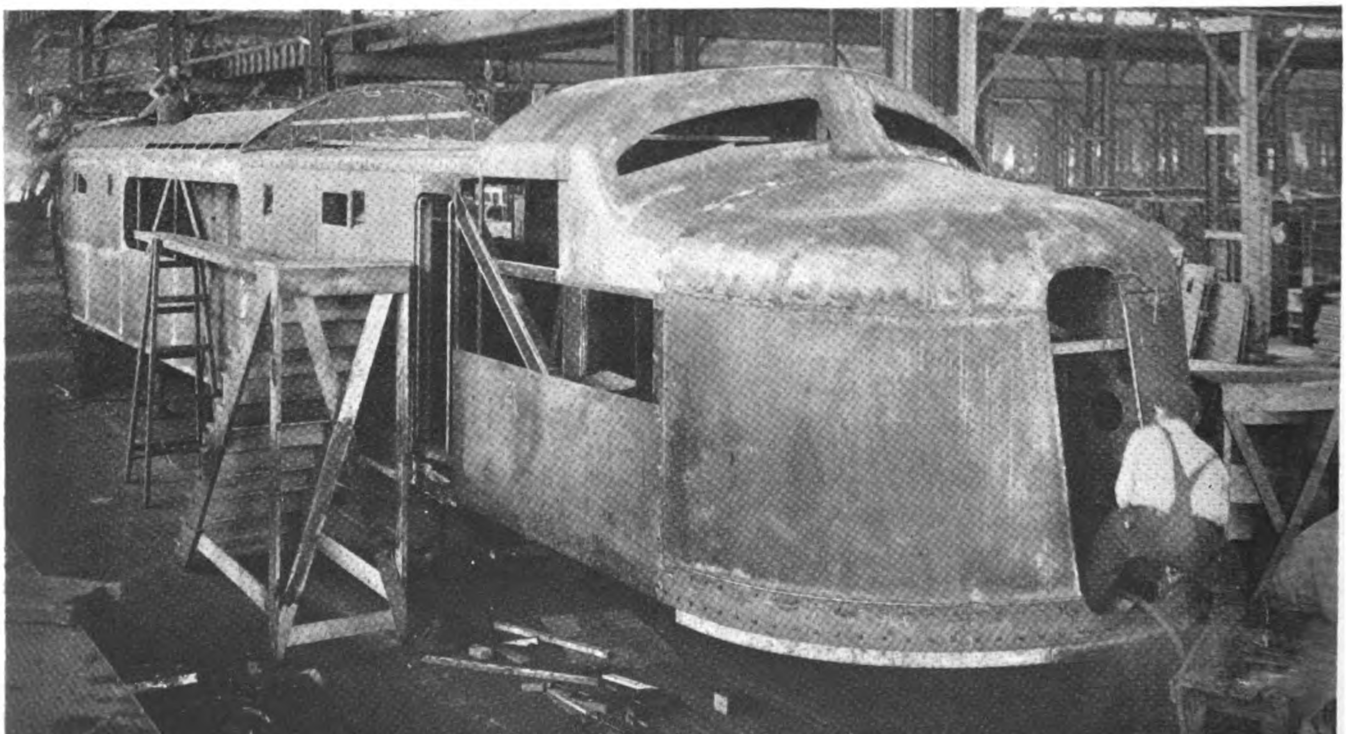
mits the torque to be transmitted from the motors to the driving wheels while allowing the axles to function in a normal way. The drive consists of a quill with drive spiders and six spring cup assemblies on each end engaging the driver wheel spokes. The quill is carried by the motor frame and lubricated by a heavy wick dipped into an oil reservoir and bearing against the quill bearing. The quill is fabricated by welding process from steel accurately machined, ground and assembled to assure of uniformity of material and interchangeability. The drive springs are made of alloy steel and designed to go solid at approximately 57 per cent adhesion; the cups will go solid at approximately 52.2 per cent adhesion based on 60,000 lb. rail driver load. Hence, since the cups go solid first, it is impossible to overstress the springs. The cups are made of mild steel forging machined and case hardened to provide long wear.

Electrical Equipment

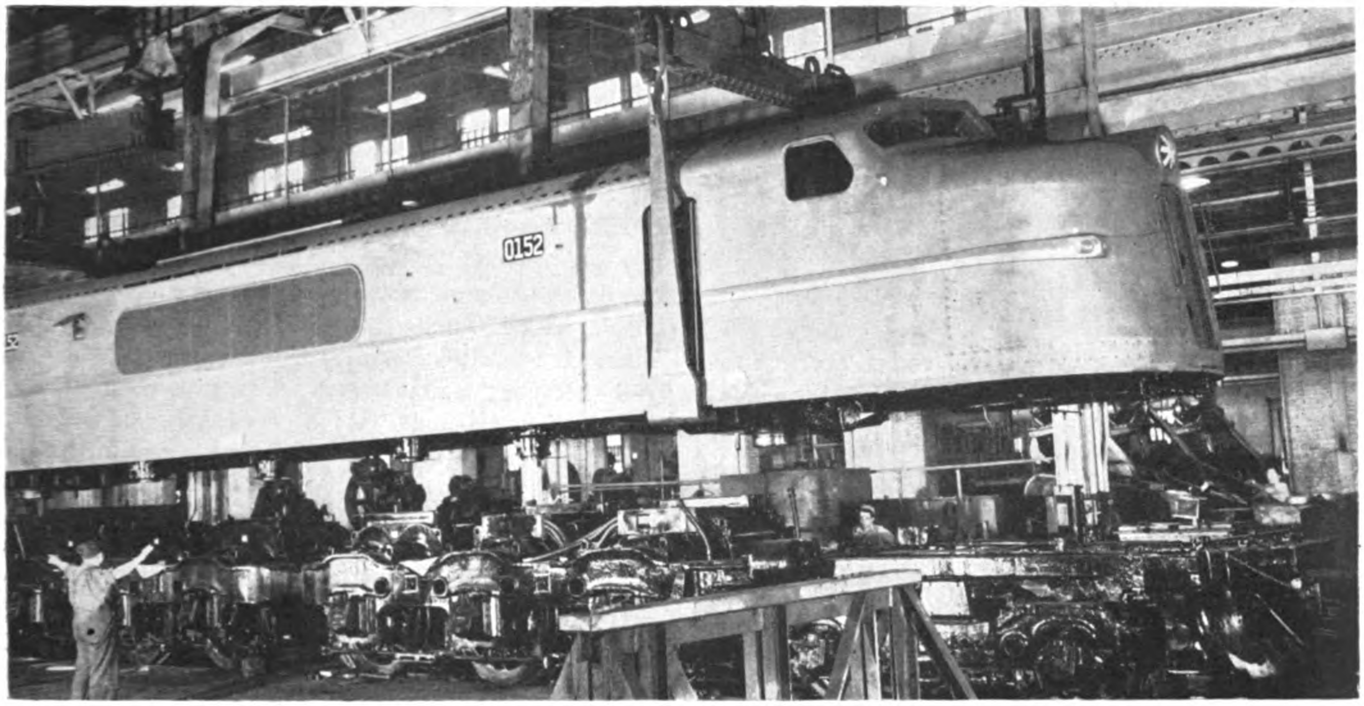
Each of the six driving axles is driven by a twin,



The quill drive—the quill is fabricated by welding and is carried by the motor frame—six spring cup assemblies on each spider engage the spokes of the driving wheel



The locomotive cab under construction



The floating locomotive cab weighs 142 tons; the chassis, 108 tons

The engineer's control and brake stand — the assistant's stand is directly across the cab

single phase, 25-cycle commutating pole series motor. Each twin motor rates 810 hp. continuously, and for shorter periods can produce a maximum output of 1,500 hp. Initially for freight service, the motors are geared 18/89 teeth, 4.95 to 1 ratio, for a maximum locomotive speed of 65 m.p.h. Provision is made for the application of 90 m.p.h. gearing whenever it should become desirable to do so.

Each twin motor is mounted on the main truck frames by a three-point support. On one end of the motor the two supporting feet are bolted solidly to the frame by means of keys. The third point of support on the opposite end is a sliding pad which permits the motor to expand longitudinally.

The arrangement of the control apparatus in the cab is shown on the diagram. The heart of this control system is the transformer unit on which is mounted the control switches, etc. To permit smooth control, 22 normal running steps are used. Under conditions of bad rail, etc., these 22 steps can be split into 63 steps by a simple manipulation of the controller handle. The performance curve for the locomotive with the 22 main steps is shown.

The mechanical portion of these locomotives was manufactured by the Baldwin Locomotive Works, the electrical equipment by the Westinghouse Electric and Manufacturing Company, and the locomotives assembled in the Westinghouse plant at East Pittsburgh.

EDITORIALS

Find Out What You Can Get

Several times in recent weeks we have had occasion to visit the plants of some of the many builders of machine tools whose products find their way to the railroad repair shops. It would serve no special purpose to go into detail regarding the multitude of mechanical miracles that these manufacturers have accomplished in the past two years, for most of the important things they have done come under the head of military secrets. It does, however, serve a worthwhile purpose to call attention to certain matters of interest to the railroad shop man.

At the outset it is reasonable to say that the pressure of war production work has brought forth developments in machine tool design, tooling equipment and operation that, under peace-time conditions, would have been many more years in the making. Stated in another way, we now have the privilege of making use of machine methods that might otherwise have been months or years away. Already, in war production work, many methods formerly used are obsolete; far better ways have been found of doing the same jobs much faster. When the machining progress of only two years is observed one of the first impressions that a railroad shop man gets is that practically all railroad machining methods are now so far out of date that there is no comparison at all. This seems like a rather blunt statement but, be that as it may, the fact remains.

For years it has been pointed out that the modernization of railroad repair shop facilities would, in slack times, enable the roads to make substantial economies in repair operations and, in times like these, provide a margin of excess shop capacity that would make it possible to meet unusual demands even in the face of shortages of skilled labor such as are being experienced today. Several of the more progressive roads completed modernization programs before this country got into the war and today those are the roads with the fewest maintenance-problem headaches. They are also the roads that are helping out on war contract work, while keeping up their own motive power repair programs.

One of the reasons for backwardness in the modernization of railroad shop facilities is the traditional pride that certain railroad men take in "getting along with what we've got." For a New England farmer that is an admirable policy for it affects only his own ability to produce and his own ultimate economic status. It is not, however, a desirable policy in industry for the simple reason that in normal times one might easily get along with a 20-year-old machine capable of producing 50 units of work a day as compared, for example, with 150 units that a modern machine can produce. It was argued then that the old machine was all right because the 50 units was all that was needed. But today, when 150 units may be needed, it can only be produced on the old machine by the expenditure of three times as many man-hours—man-hours that might more profitably be used to help win the war.

We all know what lack of military preparedness means and many of the officers and supervisors who decided to get along with what they had can now look at these old machines and learn a lesson in industrial preparedness. For actually three skilled men are standing at the old machines today doing a job that could have been done by one man on a modern machine, while the other two men could be building more guns, ships or planes.

You may say, "Why bring this up now, it's too late to do anything about it." That's just the point, it isn't too late and something's got to be done about it—right now!

It isn't necessary to call attention to how much tonnage and how many passengers the railroads are being called upon to handle. More than ever before in history—that's an easy answer. What is necessary is to call attention continuously to the fact that equipment is being worn out two or three times as fast as ever before and if you're a shop man it's up to you to repair it and get it back in service in a hurry. To speed this job up there are several things you can do. First, and most important, you can find out what improvements are being made, mostly in war production work, that can be adapted to your work. You can do this by taking a few hours once or twice a month and visiting some nearby plant where the last word in modern equipment is being used or by attending local meetings of technical societies, foremen's clubs or similar organizations.

Second, you can personally acquaint yourself with the things you need in the way of shop equipment and machine tools that are available to you. Priorities or no, there are many things that you can get if you just know what can be had, and ask for it. Within 24 months one railroad has acquired over a million dollars worth of shop equipment by knowing what to ask for and keeping after it.

Third, don't let yourself get into the frame of mind that the railroads are not a defense industry and that. therefore, you have to take what's left over after everyone else has taken what he wants. Regardless of priority ratings the railroads are at least the second line of

defense. Anyone who travels on business these days and talks to people in defense industries is becoming more and more impressed by the fact that if the railroads fail so also will war production fail and the fighting forces will be handicapped by a shortage of the things they need.

Make it your business, therefore, to find out what's going on; find out what the other fellow has got that you could use to conserve man-power and increase output; find out where you can get it, then ask for it. If, for reasons best known to others, its use is denied you the responsibility will be theirs, not yours. But remember—the responsibility is yours, if you fail to ask.

Defective Cars Still Being Loaded

In spite of strenuous efforts, including a widespread publicity program sponsored by the Association of American Railroads, too many defective freight cars are still being loaded and, when unloaded, they are not repaired promptly enough. In the latter respect, it must be admitted that railroads seem to have partially at least the same attitude as the man who couldn't repair the leaky roof of his house when it rained and when the weather was fair he didn't need to.

A study of car conditions at one of the most important gateways in this country shows that three times as many loaded cars had to be transferred on account of mechanical defects and twice as many open-top loads adjusted in 1941 as in 1940, and railroad performance in these two particulars has not greatly improved up to date in 1942. In comparing figures for the two periods mentioned, the fact should be remembered that far more cars are now being interchanged, but it is also true that large numbers of cars have been taken from storage and loaded without repairing more or less dangerous defects and, as recently as a few weeks ago, a car equipped with obsolete and unsafe arch-bar trucks appeared at an interchange point where its load had to be transferred very much to the embarrassment of those responsible for the unnecessary labor cost and delay to the shipment which this transfer caused.

As stated in these columns, not long ago, freight cars have to be sent to repair tracks primarily for truck failures, including cracked side frames and bolsters, defective wheels, cut journals, broken brake beams, or hangers, etc., although car body defects, leaky roofs, defective doors and out-of-date airbrake cleaning and journal repacking constitute prolific sources of necessary car repairs with attendant delays. The urgent demand for more and more freight cars is, of course, responsible for the action of railroads in pressing every possible car into service, but cars which have been idle for a more or less extensive period of time should certainly receive careful inspection by competent mechanical men before being turned over to the operating department and placed for loading. It serves no one any good purpose to hurry this operation so much that defective cars are actually loaded and have to be repaired or have loads transferred at the first interchange point.

Another condition besides mechanical defects which delays freight cars submitted for interchange is the failure to load cars in accordance with the interchange rules and the disarrangement of loads in transit, generally due to non-observance of those rules, or rough train and car handling. At the important interchange point previously referred to, almost 700 open-top cars required load adjustment in 1941 owing to non-conformance with the rules and over 6,500 loads on open-top cars had to be adjusted on account of shifting. From the point of view of efficient and effective railway operation in the present war emergency, it will certainly pay railway men to redouble their efforts first, to avoid accepting incorrectly loaded cars from shippers and, second, to prevent the rough handling, whether it occurs on line or in transportation yards, which shifts loads and necessitate costly adjustments and delay.

While a certain rather limited number of load adjustments are required on box cars, due to side doors or various parts of the cars being forced outward, it is open-top cars which give most trouble from shifted loads, as outlined in the preceding paragraph. Open-top cars of the hopper type and gondola cars equipped with drop doors also are subject to delay owing to being offered in interchange with doors open contrary to the rules, or, in some instances, loss of lading due to defective or only partially closed drop doors. Almost 3,000 instances of open hopper or gondola car doors were reported at the interchange point mentioned in 1941, and over 300 cars had to be shopped on account of loss of lading through the drop doors, which was an improvement over 1940.

The record with respect to perishable freight handling was still better. With a total of 528,215 perishable loads handled, only 4,473 required shopping on account of mechanical defects and, of these, all but 52 cars were repaired promptly enough to make their original schedule deliveries. This is a good performance on the average and shows what can be done by concentrated effort devoted to a limited number of objectives.

Examination of the detail record, however, shows a wide diversity in effectiveness of the work on different railroads. The only answer is for the railroads individually and collectively to set up measuring sticks of performance for these desired objectives, publicize the results in a comparative statement, issued periodically and showing what each road is doing, correct and chastize (figuratively speaking) the "weak sisters," give special commendation and credit for exceptionally good performance and thus stimulate all to greater efforts in the joint enterprise now confronting the people of this country.

When In Doubt—

A frequently quoted axiom in many card games is. "When in doubt, lead trump." Trump in this war, so far as the labor situation is concerned, means the employment of women in all available jobs which they can fill and for which they can be hired. The operation of the Selective Service Act is making increasing inroads on the personnel of the mechanical departments of the railroads. It is possible, if the War Manpower Board ever really begins to function, that skilled workers from the railroad shops may be transferred to employment in other industries considered of more immediate importance to the war effort. Much has been made of the employment by a few railroads of a few women workers in mechanical occupations, but so far the number so employed means little in the whole labor picture.

If there is any doubt in the minds of mechanical department officers about the ability of women to perform many, in fact most, of the tasks involved in the repair and maintenance of equipment, they need only check the performance records of the women employed during the last war. The women of the present generation are at least as skillful as their mothers, and other industries are drawing heavily upon this pool of labor. Statements appear frequently from executives and supervisors attesting to the adaptability, capability and willingness of women who are being employed in increasing numbers in many industries, some of them on what was formerly considered "men's work." Most of the occupations on which men are now engaged in railroad shops are not beyond the understanding and performance abilities of women.

According to Pauline Goldmark, Manager, Women's Service Section, United States Railroad Administration, in a statement made in December, 1918, one railroad reported that women were employed in 99 different occupations on the road. Among these occupations relating only to mechanical department work were: lathe operators, drill-press operators, shaper operators, milling-machine operators, hammer operators, welders, cutters and burners, air-brake repairers and inspectors, turntable operators, locomotive wipers, car repairers, car repairer helpers, box packers, toolroom attendants, boilermakers, coppersmiths, electricians, coach carpenters, helpers and apprentices, patternmakers, helpers and apprentices, upholsterers, blacksmiths, mechanics helpers, painters, crane operators and laborers. With this variety of occupations represented, there can be no doubt that the labor shortage in railroad shops and enginehouses, present and prospective, can be relieved by the employment of carefully selected women workers.

With a probable need of more than 300,000 new workers in the railroad industry during the coming months there are not many choices to be made among the potential employees. Discards and rejects from other industries, youths under twenty and women now constitute the pool from which railroads can draw their new personnel. The first group are hardly likely to prove able or desirable; the second offers no more than a few months of potential service before the demands of the armed forces will take them; the third group can be trained, will perform ably, and will remain on the job as long as the emergency lasts.

It is interesting to note that among the total of 101,785 women employed at the peak of their service during the last war—October 1, 1918—only about 6,000 were employed in backshops and enginehouses. By July 1, 1919, only 82,294 women were on the payrolls of the railroads and the heaviest reduction in this force had occurred among those employed in the enginehouses and backshops. The same situation will undoubtedly occur when the present war is over as men are released from service and return to exercise their seniority rights in mechanical-department jobs.

There are difficulties involved in the hiring of women, but they are largely procedural and sanitary. Ways can be found to direct, supervise and, if necessary, discipline women employees. Additional rest and washroom facilities can be supplied. Other industries have done it; the railroads can. Not a difficulty but a point to be carefuly considered is the manner in which the women employed shall be selected. In numerous instances during the last war, women were chosen and assigned to occupations either undesirable in nature or beyond the physical capacity of the worker. A well-regulated and intelligent personnel policy will assure any railroad hiring women workers that the difficulties encountered 25 years ago will not now be repeated. A study of the reports of the Women's Service Section of the U. S. R. A. will prove a valuable guide in choosing from among the applicants who desire work.

Best of all recognitions of the value of women, and their real part in the war, lies in the fact that the War Department is now enlisting and training women to participate as active, not shielded or pampered, parts of the regular army organization.

New Books

ENGINEERING ENCYCLOPEDIA. *Published by The Industrial Press, 148 Lafayette street, New York. Two volumes. 1,431 pages, 206 illustrations, 6 x 9 in. Price, $8.00.*

The Engineering Encyclopedia supplies essential facts about 4,500 standard and special engineering subjects. In general, this encyclopedia consists of concise treatises ranging from short paragraphs to several pages in length dealing with various important mechanical laws, rules, and principles; physical properties and compositions of a large variety of materials used in engineering practice; the characteristic features and functions of different types of machine tools and other classes of manufacturing equipment.

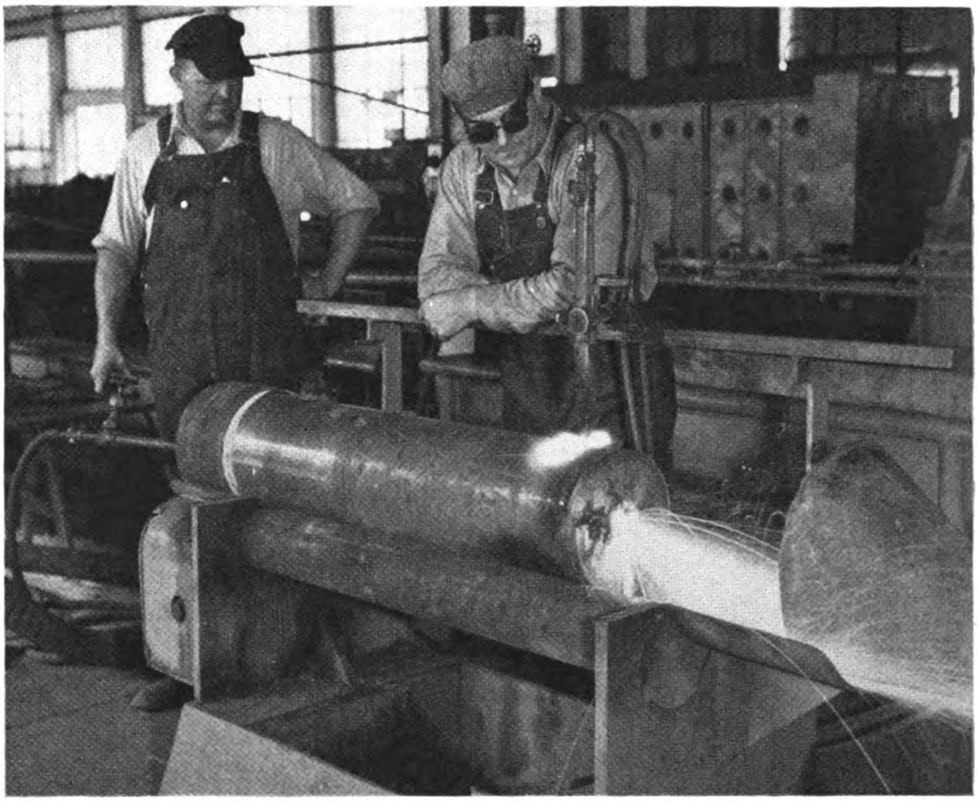
All matter is arranged alphabetically under the heading or word likely to be referred to, thus making the Encyclopedia self-indexing. There are also many cross references to other closely allied subjects.

Sacramento

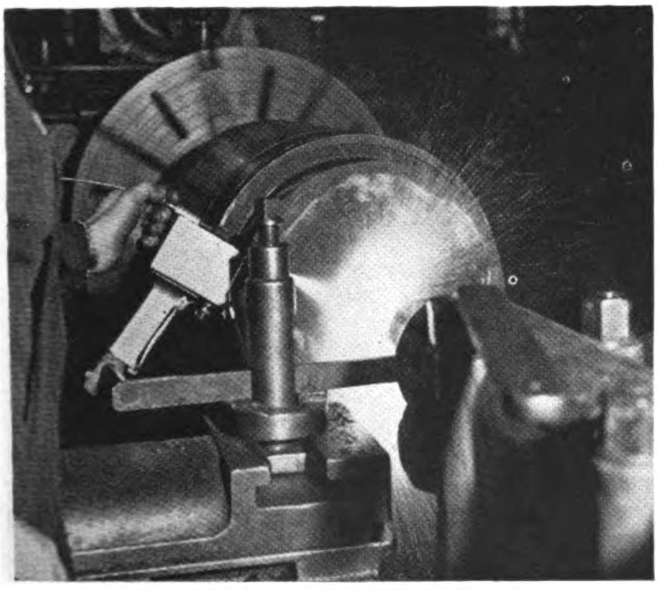
Locomotive Shop Kinks

A GREAT deal of thought and effort has been given to improving the facilities and equipment in the repair shops and the enginehouses of the Southern Pacific at Sacramento, Calif., also at outlying division points. The rapid and steady increase of locomotives and cars turned at various terminals, and the losses of qualified employees have made it necessary for all concerned to find some ways to expedite the repairs and servicing of this equipment in order to maintain the standard of safety and to "Keep 'Em Rolling."

As the need for quick turning of power at terminals became evident, additional oil and water columns were installed, both on the outgoing and incoming lead tracks, so that locomotives could be serviced within a short space of time. Also on main lines at passenger stations, water and oil columns were installed so that through-passenger engines could be fueled and watered on the train during the dead time of the train at terminal, without having to cut the locomotive off the train and take it to the sandhouse for this operation.



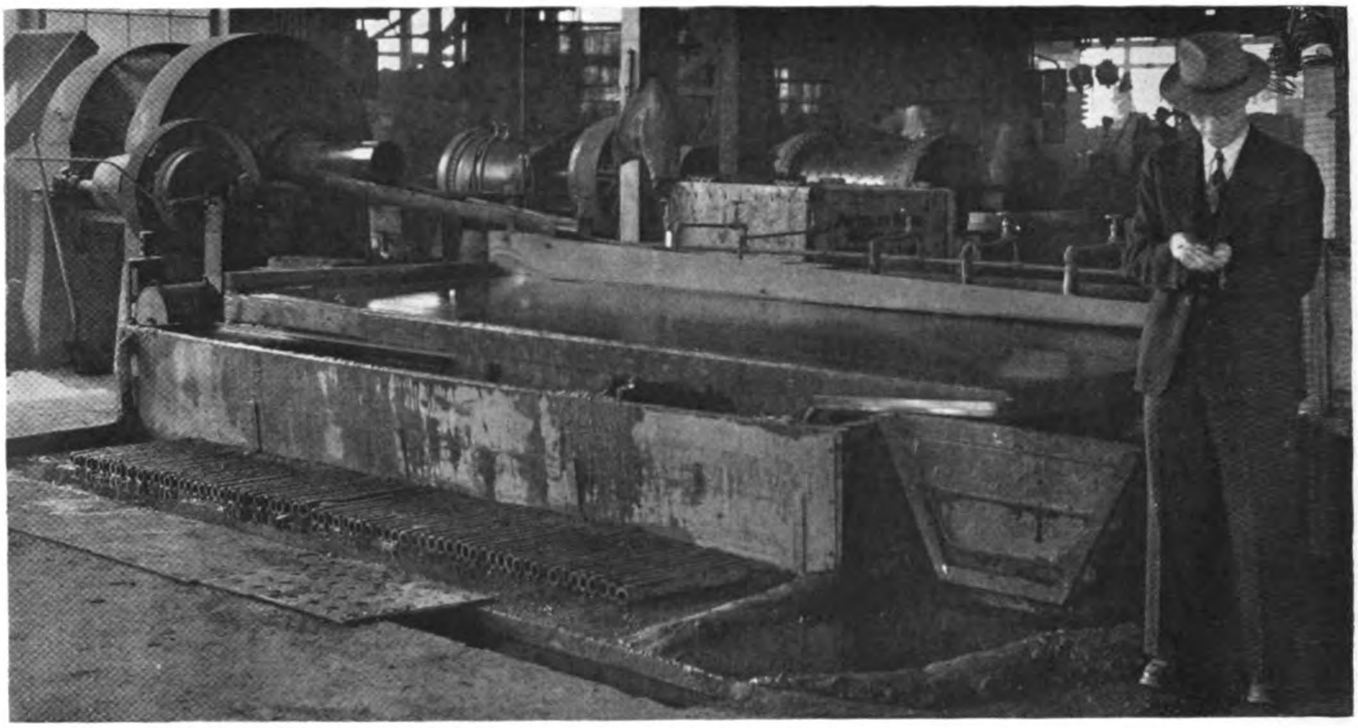
Gas cutting large steel bushings from hollow-bored driving axles



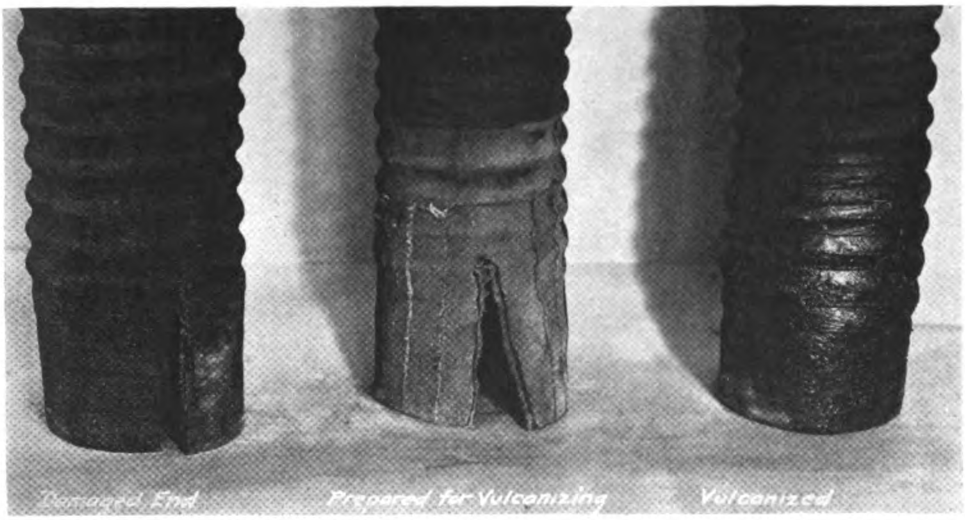
Speedmaster metal-spray machine in use at the Sacramento shops

While constant lubrication of locomotives is particularly essential on mountain territory such as encountered on the Northern district of the Southern Pacific, certain parts of locomotives difficult of access are at times neglected, which results in these parts becoming worn through lack of lubrication and having to be renewed. The S. P. found that by concentrating lubrication forces into gangs under the supervision of a lead mechanic, who is responsible for seeing that each locomotive is thoroughly and systematically lubricated, a thorough job of lubrication is assured.

In the general repair shops at Sacramento, much thought and planning has been given to substitutes for critical materials, reclamation and conservation of materials on hand, and the reclamation of scrap materials for



Concentrator which reclaims brass from foundry sand at Sacramento shops

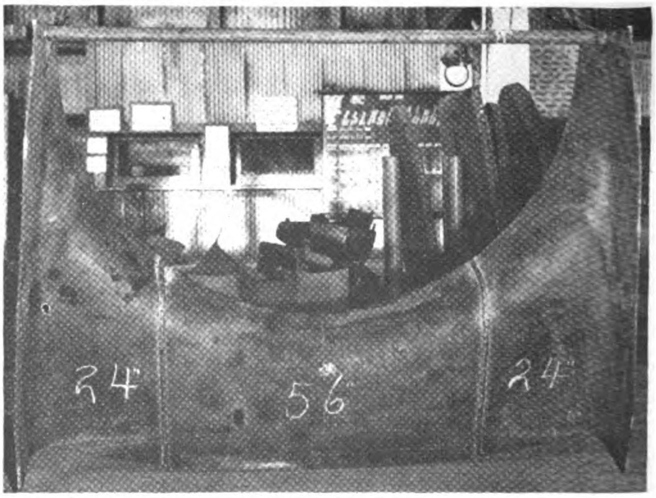


Damaged tank hose before and after being reclaimed by vulcanizing

re-melting or re-use. Some of the most practical and most interesting are here briefly described and illustrated.

Large steel bushings are made from scrap locomotive driving axles on a machine built in the local shops. It is used for cutting scrap hollow-bore driving axles for making various bushings used on locomotives. The axle is placed on rollers on the machine and lanced with an oxygen torch as a starting point for the acetylene torch. As the axle is revolved at a uniform cutting speed, the torch cuts from outside into the hollow bore. The segment cut off is then preheated and the inside is cut out to make a proper-size bushing.

The Southern Pacific has had in use for some time a Speedmaster metal spray gun, purchased from the Master Metal Company, Inc., which is used to great advantage in reclaiming machine and locomotive parts such as monel pump shafts, electric motor armature shafts, automobile brake drums, in fact, any parts subject to wear. It has been of particular advantage in building



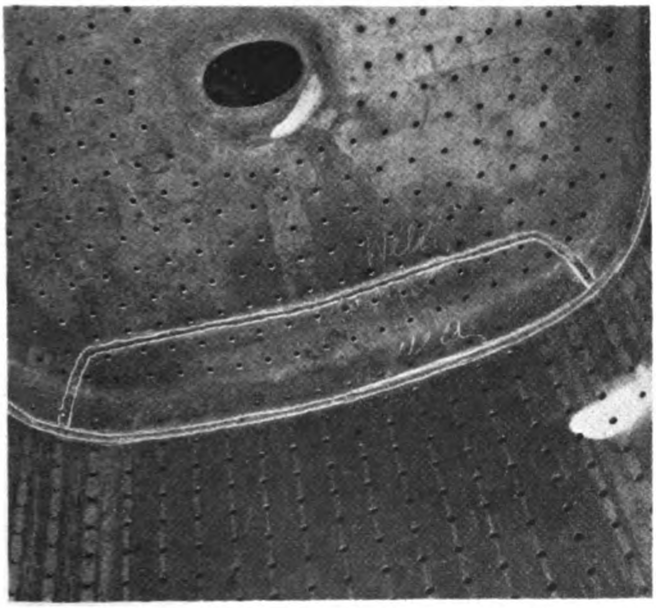
Complete boiler throat-sheet formed by welding together three separately flanged sheet sections

up monel feedwater pump shafts eliminating replacement of shafts of monel which it is impossible to purchase during the present emergency. Monel shafts are built up using ⅛-in. diameter stainless steel wire. This machine is also used to spray zinc on the coach steps, and miscellaneous shop tanks and vats to prevent corrosion.

The brass foundry at Sacramento supplies castings for all the Pacific Lines. Foundry sand when scrapped and sold formerly contained up to 30 per cent brass. A concentrator consists of a ball machine and cradle washer and is used to wash all sand leaving the foundry. Sand leaving the foundry now contains only about 7 per cent brass by weight. Thus, large quantities of brass formerly lost are re-used, conserving the supply.

The shortage of rubber material has increased the demands on the rubber vulcanizing department, and work is now being done that was not considered a short time ago. The S. P. is successfully vulcanizing tank hose that have been split on the ends. The same method is also used to repair rubber diaphragms used between streamline cars. To help prevent tears from progressing the full length of diaphragms, cross-strips are vulcanized on the inside at equal intervals. Shop-made equipment is also used to make repairs to tubes, tires, etc., and manufactures from scrap rubber various items such as gaskets, pipe protectors, rubber bumpers, etc.

Along this line, brake valve, triple valve, etc., gaskets are being reclaimed successfully by boiling in a cleaning solution, and then rubbing with graphite and glycerine to restore the flexibility. This process successfully raises

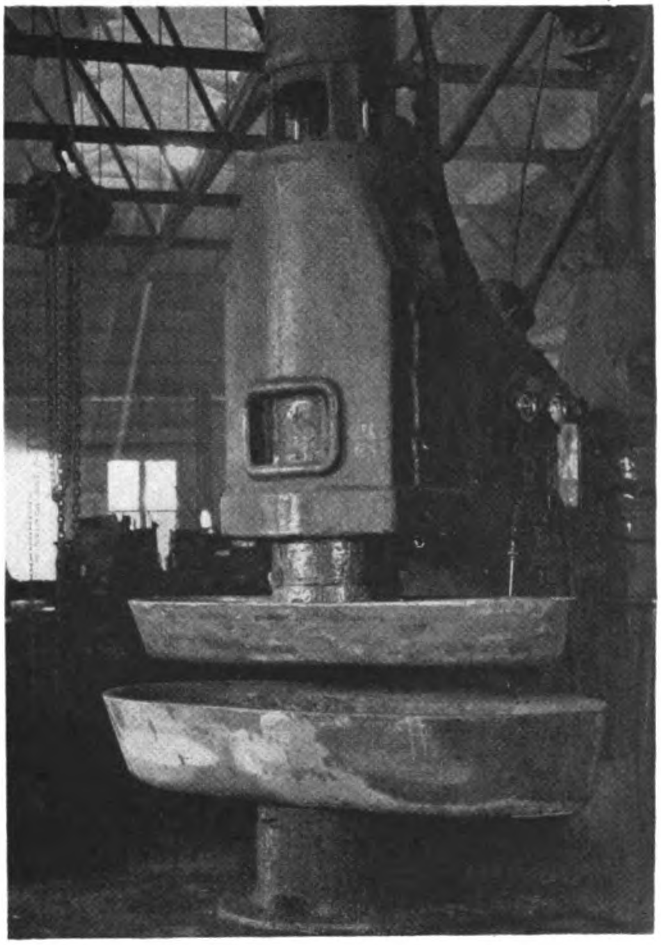


A door-sheet patch welded in place in the firebox

the embossing between the ports, thus reclaiming 70 per cent of the gaskets that were previously scrapped.

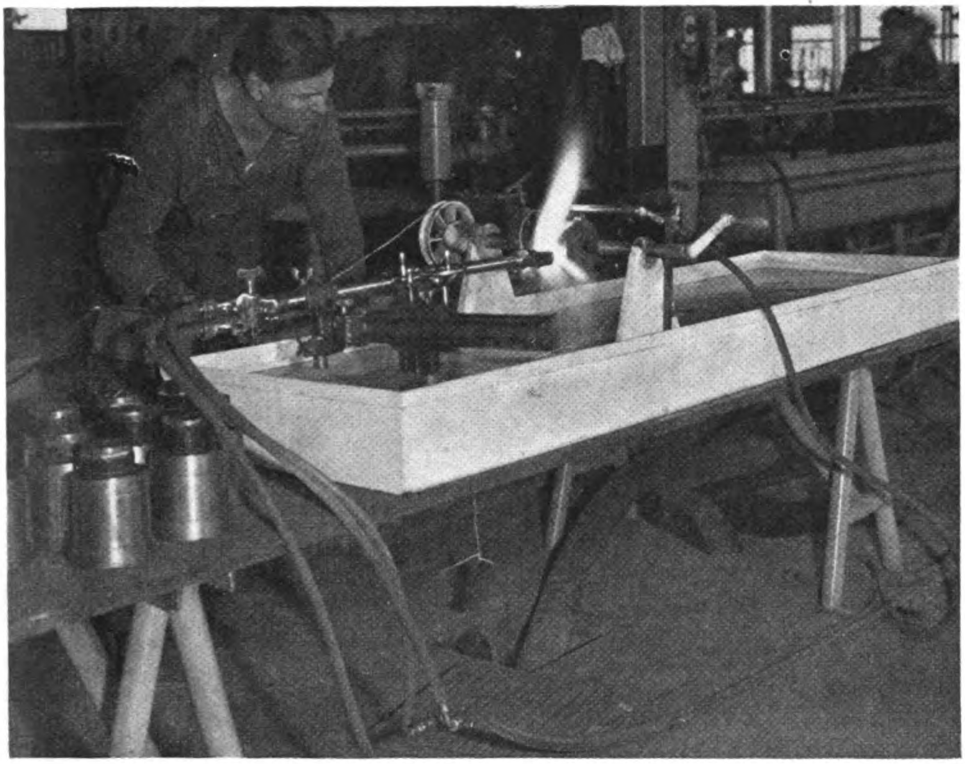
Similarly, fabrication of parts to replace steel castings on locomotives has been done for some time. Some of these items include draft castings, valve motion bearers, pilot knees, driving boxes, and guide yokes.

In connection with boiler repair work, the S. P. has recently made dies for boiler patches which are designed to be cut in two after the patches are banged. Die-flanged patches being made at the present include center and top corners of outside throat sheets, bottom of front tube sheets, top and bottom of back flue sheets, top of firebox door sheets, and mud ring corners of firebox door sheets.

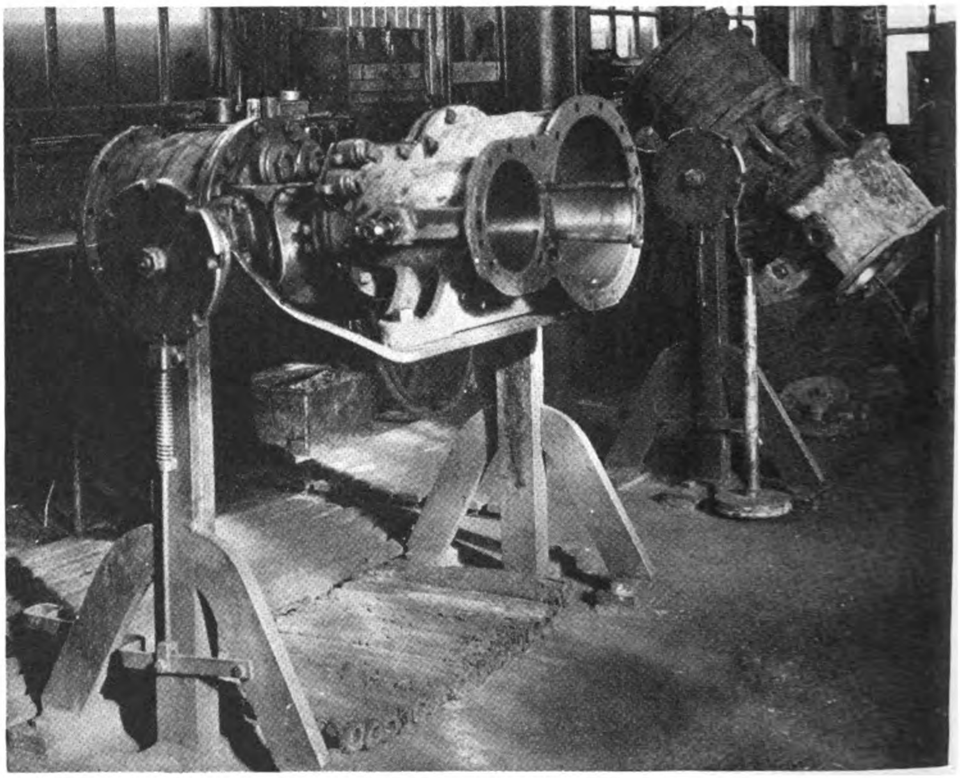


A 300-ton press equipped with dies for flanging firebox door-sheet patches

Door-sheet patches, each of which is cut down the middle to make two patches



Equipment used in oxyacetylene flame-hardening side-rod knuckle pins



Air-compressor stands which can be set at various positions for most convenient work by the repairmen

This has saved considerable time and expense in boiler repair work. For example, the patch for the top of the firebox door sheet formerly took the flange fire gang eight hours to make a single patch. Now the same gang can make 12 of the same patches in 8 hours. Furthermore, die-flanged patches are more uniform as to thickness and dimensions, and uneven heating due to hand flanging has been eliminated. A 300-ton press equipped with dies is used for making firebox door sheet patches. One of the illustrations shows the patches as flanged, later to be cut in half to make two patches. Another shows the patch welded in place.

The 300-ton press available for this work is not of sufficient size or capacity to flange whole tube or throat sheets. However, the S. P. is flanging inside throat sheets in three pieces and welding them together to make a complete throat sheet. This is an improvement over hand-flanged sheets, as well as a large saving in time and labor.

Acetylene flame-hardening tips are used to flame-

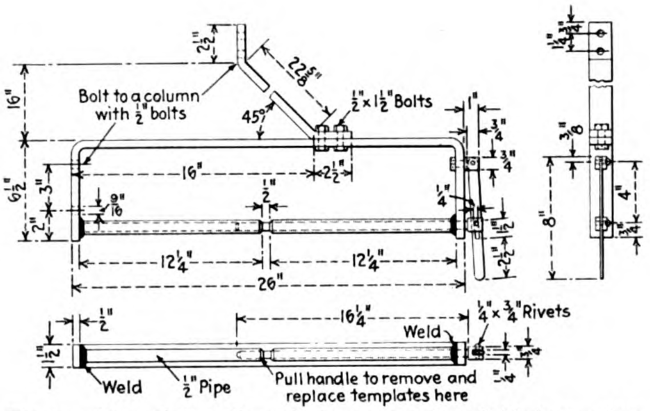
harden side rod knuckle pins. It is expected that their use will be extended to crosshead guides and various bushings as soon as proper tips are obtained.

Stands for holding air pumps when being repaired have been in use for some time. The stands can be set in various positions for the different repair operations, saving time and making work easier and handier for repairmen.

Rack for Holding Templates

At best the templates that are used around the average shop are awkward things to store. Because they are time savers, every shop has a number of them and the question is how to keep them where they are readily accessible and in as neat a manner as possible. A further requirement is that of being able to select any one that is wanted without moving most of the others. The accompanying photograph shows the device mounted on a shop column with a number of templates in the rack. The drawing shows the details of the rack. The principal feature of this rack is the support which is in two pieces; each being welded to the rack in such a manner that a ½-in. opening is left between the ends. Through one of these sections there is a rod connected to a handle on the outer end of the rack. When the handle is in the "in" position, this solid rod is long enough to protrude for a short distance into the other pipe section and close the opening. With this arrangement, it is possible to select any template, slide it over to the joint at the center of the supporting rod and open the joint by pulling the handle out. The desired template can then be removed and the rack closed by pushing the handle in.

Experience has indicated that all templates should be plainly marked with stencilled notations showing the name of the part, the drawing number from which the part is made and, possibly, the date of last revision of the drawing. Handled in this manner, it is comparatively simple for the workman to use the templates to get what he wants without any loss of time.



This template rack is easily made from materials available in any shop


Any template required is easily removed from this "home-made" rack

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Staybolt Breakage

Q.—We have staybolt trouble on 40-ton oil-burning Davenport locomotives. Can you give information as to why staybolts break; why some roads use a staybolt drilled through; the kind of steel to use, etc.?—F. R. D.

Staybolt breakage is due to the unequal expansion of the firebox sheet and the outside wrapper sheet because of extreme differences in temperature, typical examples of which are as follows:

Temperature of flames in firebox	1,559 F.
Temperature of fire side of firebox sheet	734 F.
Temperature of water side of firebox sheet	584 F.
Temperature of water side of wrapper sheet	385 F.
Temperature of outside of wrapper sheet	375 F.

The unequal expansion of the sheets causes the staybolts to work, tends to crystallize the metal and, in time, causes the staybolts to break. The reason for using a staybolt drilled through is to comply with Rule 26 of the Interstate Commerce Commission, which reads: "Telltale holes:—All staybolts shorter than 8 in. applied after July 1, 1911, except flexible bolts, shall have tell-tale holes $\frac{3}{16}$ in. diameter and not less than $1\frac{1}{4}$ in. deep in the outer end. These holes must be kept open at all times." In cases where the outer end of a staybolt is not accessible for ready inspection, it is customary to drill the bolt for its entire length so that the inspection can be made from the inside of the firebox. Some roads drill all rigid staybolts their entire length. Specifications for staybolt iron and steel can be found in the A. S. M. E. Power Boiler Code.

Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Reclaiming Damaged Cylinder Cocks

Q.—We have in our shop a number of cylinder cocks with the nipple threads broken out. Can you suggest a method of reclaiming these broken bodies?

A. The following method of repairing cylinder cock bodies has been found to be satisfactory. Several extra-heavy properly threaded nipples are made. The broken area around the nipple hole on the cylinder cock body is ground or filed bright. The new extra heavy nipple is screwed into the remaining threads and then brazed solidly to the cylinder-cock body.

Welding on Rocker Castings

Q.—Can worn trailer rocker castings, sometimes called stabilizer swing links, be economically reclaimed and what method do you recommend?

A. Worn trailer-truck rocker castings can be economically reclaimed. Both the oxyacetylene and the arc welding methods can be used, but machining costs on the arc welded area seem to favor the use of an oxyacetylene application. When gas welding these rocker castings the part is rebuilt to slightly above the required dimensions and hammered to a gage. A good grade of steel rod should be used.

Building Up Worn Coupler Heads

Q.—On page 318 of the July, 1942, issue there is a description of the manner of building up worn coupler head blocks by gas welding. What is the recommended method of doing this job by the electric arc process?

A.—Worn coupler blocks can be reclaimed by the electric arc process by merely depositing a large diameter mild steel shielded arc electrode on the worn surface. If the wear is excessive it is often more economical to weld a plate of the desired thickness over the worn surface. The plate should be ¼-in. smaller than the worn surface all around to permit sufficient weld metal to be deposited. Also allow space around the pin for welding.

Lengthening Drills By Electric Welding

Q.—On page 317 of the July, 1942, issue there is a description of the manner of welding an extension shank on a drill by the gas process. Can this job be done by electric arc process?

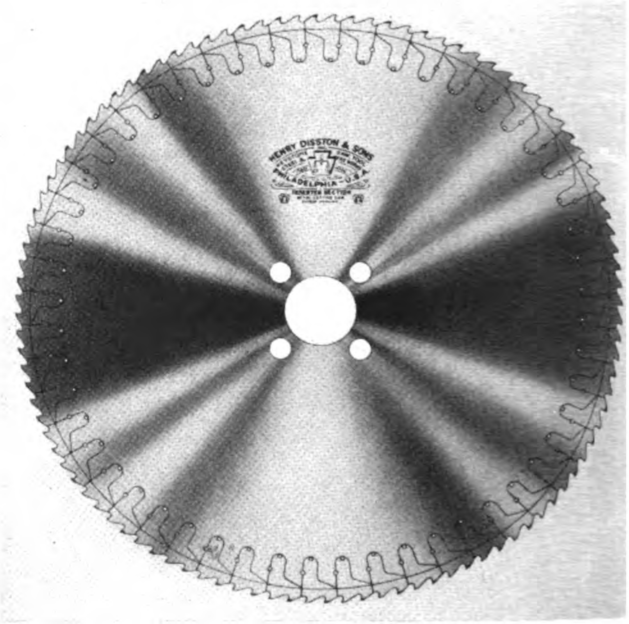
A.—Either carbon or high-speed drills can be welded to a long shank by the electric arc process. Both the drill and the shank should be prepared by grinding to a flat double vee. Provided the drill and the shank are the same diameter, they should be placed in the trough of an angle in order to insure alignment while welding. Should one be smaller than the other, shims should be used to obtain proper alignment. Always make certain that the drill is straight.

On carbon steel drills weld one side completely using a ⅛-in. mild steel shielded arc electrode and then repeat on the other side. After welding, the tool should be allowed to cool slowly.

On high speed drills it is advisable to cool the welded car by placing it in dry asbestos or lime. While a mild steel shielded arc electrode will usually prove satisfactory in welding high speed drills, for best results an 18-8 stainless steel electrode is recommended on account of its high ductility.

Improved Inserted Tooth Metal Cutting Saw

A recent development in circular metal-cutting saws, combining the advantages of both the inserted tooth type and solid tooth type has been made by Henry Disston & Sons, Inc., Philadelphia, Pa. It is a continuous-rim saw with inserted sections rather than inserted teeth—a saw that can be readily sharpened on an automatic grinder. This saw provides a maximum number of teeth for any given diameter and makes extremely smooth cuts. It can be operated at speeds up to 5,000 ft. per min. The design permits a thinner blade and



Inserted sections permit thinner blade and narrower kerf in this metal-cutting saw

cutting edge than is customary with saws having individual inserted teeth and the kerf is narrower which means that less power is required to drive the saw.

The design of the inserts is such that the cutting load is transmitted from each insert directly to the blade approximately at right angles to the resultant force, and not to adjacent inserts or to the rivets. The full thickness of the blade extends to the extreme diameter, thereby giving maximum support to the inserts but at the same time it permits long life without any cutting into the projections when sharpening. The inserts are quickly and easily replaced if they are damaged by accident. Special emphasis is laid upon the fact that it is not necessary to return this saw to the factory to have it refitted. Such work can be done in the user's own factory, or some nearby saw repair shop.

Conditioning Passenger Cars for Troop Movement

In a recent circular letter to voting and associate members, the A. A. R., Mechanical Division, reports that a number of troop trains originating at army camps and delivered to connecting lines have a large number of brake shoes worn completely out and a portion of the cars have UC brakes set in direct release position and others in graduated release position, necessitating delays to trains enroute in order to apply brake shoes and change the brake settings.

In order to expedite the movement of troops and their equipment, the Mechanical division recommends that the brake equipment on cars used in this service be prepared and adjusted at originating points before being set for loading so as to insure their movement over maximum distances without further adjustments. This can be accomplished by compliance with the following instructions which are not inconsistent with recommendations "governing the operation of passenger cars in freight trains," circular DV-846 of May 27, 1935:

Brake equipment should be "in date" and in proper operating condition.

Brake shoes should be new or in sufficient thickness to complete the trip to final destination.

Slack adjusters (when cars are so equipped) should be adjusted to provide maximum take-up before requiring readjustment.

Piston travel should be not less than nominal nor more than one inch greater than nominal.

Passenger cars having graduated release feature must have this feature cut out for movement in freight trains.*

The time and labor involved in disconnecting the emergency reservoir and plugging the connections or removing the protection valve springs on the U. C. equipment in cars to be handled in freight service and recoupling them upon the return of the car to passenger service is not justified by service performance.

The water-raising system on passenger cars, when handled in freight service should be cut out when conditionings permit and a cut-out cock is available in the water system supply pipe.

The method of handling mixed trains is primarily the responsibility of each individual carrier in accordance with standard train handling instructions. The above instructions were prepared by the A. A. R. Committee on Brakes and Brake Equipment.

---

* Where mixed trains are involved, having more than 25 cars, instructions as above should be observed. Where mixed trains are involved, having a total of 25 cars or less, they may be operated in the conventional manner without any special changes or provisions. No change is recommended in the standard setting of the safety valves from 60 lb. or any other value.

A.A.R. Arbitration Report for 1942

During the year, Cases 1786 to 1788, incl., have been decided. A vote of concurrence in the decisions is respectfully requested by the Arbitration Committee.

As a result of letter ballot action last year, a new requirement of Rule 3 was approved to make mandatory the use of standard extra heavy air-brake pipe on cars built now or rebuilt on or after January 1, 1942. To provide for cars ordered for delivery in 1941, construction of which was unavoidably delayed, this effective date was advanced to September 1, 1942. No further extension on this account appears necessary and none is recommended.

With the approval of the General Committee, all car owners were notified under date of September 24, 1941, that no extension beyond January 1, 1943, would be granted for the requirement appearing in Par. (b-8) of Rule 3 providing that all cars must be equipped with A.A.R. recommended practice or A.A.R. approved equivalent design of bottom-rod and brake-beam safety support, to be acceptable from car owner; and that this provision would become a general interchange requirement effective July 1, 1943. Notice to this effect also appeared in the 1942 Code. No requests have been received for an extension of these dates. This is a safety measure and it is recommended that no further extension be granted.

It is also recommended that no extension beyond January 1, 1943, be granted for requirement appearing in Par. (j-2) of Rule 3, prohibiting acceptance from the owner of cars not having journal-box packing prepared and boxes repacked in accordance with the A.A.R. standard. With the approval of the General Committee, announcement of this intent appeared in the 1942 Code and a circular letter dated January 9, 1942, was transmitted to the members and all private-car owners with respect thereto. The use of journal-box packing which does not meet the requirement is one of the factors which adversely affect the availability and service performance of freight cars.

A new requirement is added to Rule 3 to make mandatory the use of A.A.R. standard three-position, double-spring-type, pressure-retaining valves on cars built new or rebuilt on and after January 1, 1943, and to provide for use of the recommended practice four-position-type retaining valve and standard valve converted to four-position type, as recommended by the Committee on Brakes and Brake Equipment and approved by letter ballot.

[The committee recommended the extension in the effective dates from January 1, 1943, to January 1, 1944, of the following requirements in the present rule: Brake levers—metal badge plates; braking power—braking ratio; couplers having 5-in. by 5-in. shanks; couplers having 5-in. by 7-in. shanks: application of welded T- or L-section truck sides; tank cars—metal placard holders; Class E-3 cars not to be accepted from owner.—EDITOR.]

It is recommended that Rule 5 be modified to prohibit billing for correction of wrong repairs to brake levers, brake rods, carrier irons, draft stops, side bearings and door fixtures, after one year from date of such wrong repairs, it being considered that the car owner has received sufficient service from these items within the period specified to justify the cost thereof. Rules 87 and 94 are modified to harmonize.

A new paragraph is added to Rule 17 to permit substitution of one type of recommended practice or approved equivalent design of bottom-rod and brake-beam safety support for another, as correct repairs, the cost thereof to be restricted to the cost of the device which is standard to the car, as a safety measure and to expedite repairs to foreign cars during the emergency period. This recommendation has the concurrence of the Committee on Car Construction and the Committee on Brakes and Brake Equipment.

New requirements are recommended for incorporation in Rule 17 to permit substitutions as correct repairs of various designs of truck bolsters and cast-steel frames of the same capacity where the truck can be made safe and serviceable, in order to expedite repairs to foreign cars and avoid holding cars out of service.

A modification of Rule 32 is recommended, to provide determination of responsibility for damage caused by failure to properly control cars with car retarding device. Responsibility shall be based on the extent of damage incurred, similar to the basis now provided for damage to cars in impact switching service.

Changes in Rules 9, 56, 57, 62 and 101 are recom-

mended, to provide for the use of air hose spliced in accordance with A.A.R. specifications on cars in interchange service, as recommended by the Committee on Brakes and Brake Equipment.

Modifications of Rules 60 and 66 are recommended, to prohibit shopping of loaded cars with operative overdate air brakes or journal-box packing until the cars have reached destination and been unloaded, as a temporary measure for the duration of the war emergency, to prevent delays to important loaded cars for periodic attention to these details when in operative condition.

Recommendation is offered for modification of Rule 63 to make mandatory the application of brake-head wear plates where the distance between lugs has reached 2⅛ in. but less than 2⅜ in., in order to increase the service life of brake heads and thus conserve material.

With the approval of the Committee on Wheels, Rules 73 and 73-A are consolidated as new Rule 73 covering out-of-round and worn-through chill wheels, and a note has been added to indicate that the out-of-round gage is not intended for use in train yards and to provide that condemnation of wheels by use thereof must be confined to shop and repair tracks.

Upon recommendation by the Committee on Car Construction, modification of axle condemning limits in Rules 85 and 86 are offered, brought about by a change in design of journal bearings.

It is recommended that Par. (d) and Interp. No. 2 of Rule 87, which permit the car owner to require cancellation of charges for wrong repairs indicated by billing repair card only, be eliminated. Charges are being cancelled under this rule for substantial and permanent repairs which are seldom corrected by the car owner. The change recommended will not prevent the use of joint evidence for wrong repairs when correction is necessary.

Spring Snubbers On Tank Cars

The A. A. R., Mechanical Division reports that the subject of spring snubber application to tank car trucks was considered at a conference in Chicago on August 12 of representatives of the American Petroleum Institute, the A. A. R. Committee on Couplers and Draft Gears, the Arbitration Committee, the Committee on Tank Cars, the A. A. R., Car Service Division, local railroad mechanical committees from loading and destination areas for tank-car movements to the eastern seaboard, and a number of other representatives of tank-car operators.

At this conference, the matter of train partings causing extensive delays and hazards to trains of tank cars was thoroughly discussed, also tests recently conducted by the Committee on Couplers and Draft Gears to develop the cause of these train partings. The instrument records of these tests showed graphically the bounce of tank cars when not equipped with snubbers and in comparison with other types of cars, and supported the conclusion that this car bounce due to harmonic spring action at speeds above 40 miles an hour, is the principal cause of train partings. In these same tests, it was brought out that the condition of uncoupling rigging is also a contributory cause for train partings.

After thorough consideration, the conference unanimously approved a proposition to apply spring snubbers to all tank cars not now so equipped, as rapidly as the material can be made available and in the national interest, with particular reference to providing an uninterrupted flow of petroleum products to the eastern seaboard. The Mechanical Division has issued a circular reproduced below requiring the application of snubbers to all tank cars and asked the individual car owners to indicate their willingness to support the snubber application program and permit railroads to apply snubbers which will be billed for on the basis of charges and credits specified in the Interchange Rules.

Records maintained by a number of railroads are said to show that, in addition to train partings, the next most prolific cause of shopping of tank cars and resultant loss of car days is broken truck springs and the application of spring snubbers will materially reduce this truck spring breakage and also this cause of loss of car days.

How the Spring Snubbers Are To Be Applied

Spring snubbers are to be applied by tank-car owners whenever a tank car reaches their shop tracks for any repairs; by tank-car owners at loading or unloading points, either by their own forces or a delegated agency; by railroad companies whenever a tank car is on their car repair tracks. Tank car owners may notify railroad companies of their preference in one-two-three order of types of snubbers desired and railroads should comply with this as far as material in stock will permit. Substitution of recognized types of snubbers is permissible; tank cars that are equipped with snubbers should be so stenciled at both ends of cars; and charges and credits should be on a basis of the A.A.R. Rules.

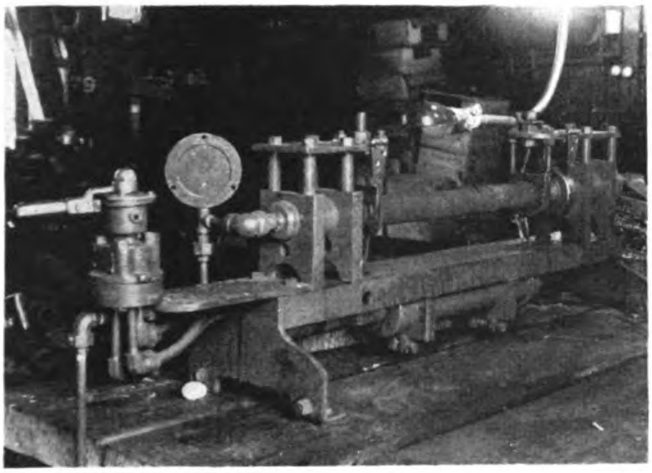
The matter of obtaining such spring snubbers for tank car trucks has been taken up with the War Production Board who advise that, in order to obtain this material, the car owners should apply on a PD-1A form for the necessary preference rating. In making such application to the War Production Board, it is suggested that the following uniform answer be given to explanation No. 2 on this form:

"These snubbers required to help eliminate delays in movement of tank cars due to trains parting and shopping enroute on account of broken truck springs. Tests have developed that application of snubbers will eliminate this trouble to a large extent and permit greater utilization of tank cars. This program is sponsored by the Association of American Railroads, American Petroleum Institute, Office of Defense Transportation and Office of Petroleum Coordinator."

Air-Hose Testing Device

An air-hose testing device, developed and successfully used at the South Louisville, Ky., shops of the Louisville & Nashville, is shown in the illustrations. Prior to the present need of drastic steps in saving rubber, it was the practice on the L. & N., like many other roads, to discard rubber air hose on an age and condition basis, after having stripped off the metal connections. With about 8,000 hose of this character on hand, it was decided to test and reclaim as many as possible in the interests of rubber conservation.

In order to save the expense of mounting the hose with fittings and testing them on a conventional machine, the L. & N. developed the tester, illustrated, which consists of a bench-mounted channel-iron section with end-supporting brackets bolted to the bench, equipped with the necessary hose-supporting nipples, air-operating cylinders, air brake control valve, pressure gage, wire-

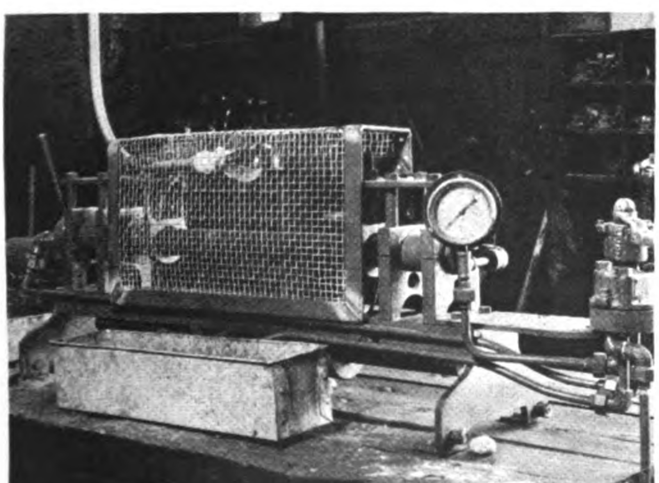


Rear view of the testing machine with safety guard removed to show the construction

mesh safety guard and galvanized iron pan used to hold the soapy water required for testing. An electric light extension, conveniently located just over the center of the hose, assures adequate visibility on dark days or whenever for any reason shop lighting conditions are unsatisfactory.

In testing each stripped hose, one end is applied over a fixed hollow nipple in one of the head blocks (the nearer one in the illustrations) and operation of the brake valve handle to the first position admits air to a small air cylinder in the opposite head block and forces out a piston and long nipple which enters the other end of the air hose. The long cylinder shown underneath the base channel is equipped with double-acting pistons which pull two short pieces of 3/8-in. steel cables tightly around the hose, one at each end, when the brake valve is moved to the second operating position. Each cable is firmly fixed at the top and extends entirely around the hose, making a tight fit on the nipple whenever air pressure is applied.

With the hinged safety guard in position, the next



Air-brake hose testing machine used at the South Louisville shops of the L. & N.

movement of the brake valve handle admits high-pressure air to the hose and, when no major failure of the hose occurs, the guard is turned up out of the way and a brush used to apply a soap-suds test to the hose for leaks, using the drip pan shown in one of the illustrations. Reverse movement of the air brake operating handle releases the air pressure and holding cables and withdraws the nipple so that the hose can be removed from the machine and another one applied. Of the 8,000 air brake hose mentioned, 2,450 were reclaimed for further use.

Location of Angle Cocks

In a circular letter, dated August 25, the A.A.R. Mechanical Division calls attention to the recommended location of angle cocks on freight cars as 12 in. out from the center line of car, 15 in. back from the draw face of the coupler and 1½ in. below the center line of the coupler (Page E-28-1942 of the Manual). This also allows a variation from the preferred location based on the formula C equals 39 in. minus 2 B, with maximum and minimum limits of 15 in. and 12 in. on C.

A recent check of hose removals by representatives of the Committee on Brakes and Brake Equipment indicated a high percent of hose being removed due to damage near the nipple end caused by a partial passing of the couplers.

In the interest of conservation of rubber, it is recommended that the angle cocks be located at the preferred location on all new cars, and that they be relocated to this location on existing cars when rebuilt or on repair track for other repairs.

Air Brake Questions and Answers

HSC High-Speed Passenger Brake Equipment

98—*Q.—How does it operate?* (See Q. 96 and 97, page 397, September issue.) A.—To establish battery supply to the relay magnets when a brake application is made.

99—*Q.—Where is the A-2 continuous quick service valve connected?* A.—To the brake pipe and straight air pipe (Fig. 15).

100—*Q.—What does this valve consist of?* A.—A body *2* (Fig. 8) attached to the pipe bracket *35* by studs and nuts.

101—*Q.—What does the pipe bracket contain?* A.—A quick service volume, two strainers and a choke.

102—*Q.—What service do the two strainers perform?* A.—Strainer *39*, which is the same as that used in the AB valve and the D-22-BR valve, strains the air taken from the brake pipe to supply the quick service volume. Hair strainer *55* is located in the exhaust opening serving to protect the opening from dust and insects.

103—*Q.—What is the purpose of the choke and where is it located?* A.—Choke *51* provides a controlled rate of brake pipe reduction with the valve in application position and is located in the face of the bracket.

104—*Q.—What is contained in the body?* A.—A piston *8* with a packing ring, a slide valve *7*, a diaphragm *14* and strut *13*, charging choke *3* and the cut off valve portion.

105—*Q.—What does the cut off valve portion consist of?* A.—Diaphragm *22*, mounted on a follower *23*, into which is screwed a hollow guide *26*, enclosing a cut off valve *27* with spring *28* and spring *29*.

106—*Q.—With no pressure in the straight air pipe, what is the position of the parts?* A.—The diaphragm is held released by spring *29*, which unseats the cut off valve, opening the exhaust to the brake pipe passage.

107—*Q.—When is the cut off valve seated?* A.—When the HSC valve is applied in excess of 5 lb. straight air pipe pressure, this pressure deflects the diaphragm and seats cut off valve, closing the brake pipe passage to the exhaust.

108—*Q.—In what way does this affect the function of the quick service valve?* A.—This nullifies the function of the quick service valve as long as the straight air brake is effective.

109—*Q.—What harm results in the event that small local fluctuations of the brake pipe cause the piston to move?* A.—None. The ensuing brake pipe reduction is prevented by the closed cut off valve.

Combined Auxiliary, Emergency and Displacement Reservoirs

110.—*Q.—Why are these reservoirs combined in one structure?* A.—In order to afford minimum space for installation and keep the weight as low as practical.

111—*Q.—Explain the functioning of the displacement reservoir.* (Fig. 4) A.—As previously explained this reservoir provides the required operating volume to develop the proper relation of brake pipe reduction. The control valve operates to admit to or exhaust air from the displacement reservoir.

112—*Q.—What controls the application and release rates?* A.—Chokes 8 and 7 in control valve pipe bracket.

113—*Q.—In this respect does this equipment correspond with previous equipment?* A.—No. On previous equipment the triple or universal valve applies and releases directly to and from the brake cylinders.

114—*Q.—Explain in detail the difference between the old and new equipment.* A.—When a brake application is made with the previous equipment the first few pounds of build-up in the brake cylinder is consumed in replacing the partial vacuum created by the movement of the brake cylinder piston from release to application position. The action of diaphragm *4* and spring *7* duplicates this condition on the new equipment. When a brake application is made the diaphragm is deflected (Fig. 4, lower view), increasing the volume so that the initial rate of pressure development is uniform with that of existing brake equipment.

115.—*Q.—How does this control valve compare with the D-22-AR and D-22-A control valves?* A.—The D-22-BR valve is the same as the AR valve with the addition of a double check valve portion (*225,* Fig. 3) on the front face of the pipe bracket.

116—*Q.—What is the purpose of the check valve?* A.—It interlocks the HSC electro-pneumatic and automatic brake systems, permitting operation of either system as control from the brake valve on the power unit.

117—*Q.—How does the D-22-AR compare with the D-22-A control valve?* A.—The same, except that the AR valve has the release interlock valve portion.

118—*Q.—What does this portion control?* A.—The graduated release and the quick re-charge features.

119—*Q.—What does this portion consist of?* A.—A piston *182,* pinned to a slide valve *183* and held to its seat by a spring *187* through a strut *185.* The slide valve has two positions on its seat between interlock diaphragm *180* and spring *191.*

120—*Q.—To what is the face of the diaphragm connected?* A.—Displacement reservoir pressure.

121—*Q.—Explain the operation.* A.—With less than 6 lb. displacement reservoir pressure, spring *191* holds the piston and slide valve in forward position where the slide valve prevents flow from the emergency to the auxiliary reservoir, and requires a movement of the service slide valve to move the release piston to close the displacement reservoir exhaust. With approximately 10 lb. displacement reservoir pressure, the spring is overcome and the diaphragm is deflected, moving the piston and slide valve to the rear position, where a slide valve cavity connects the emergency to the auxiliary reservoir, thus providing a quick recharge and graduated release function under the control of the service piston and graduating valve.

122—*Q.—What prevents back flow from the emergency to the auxiliary reservoir?* A.—Check valves *73* and *195* in the emergency reservoir charging passage.

123—*Q.—Does this feature stabilize the service piston?* A.—Yes, especially where the control valve is used with the HSC brake system.

124—*Q.—Explain the operation.* A.—During electro-pneumatic straight air brake application of the system, the auxiliary reservoir pressure is reduced into the straight air pipe, the higher brake pipe pressure thus holding the service piston in release position. With the emergency reservoir positively cut off from the auxiliary reservoir by the release interlock valve, the reduction is effectively obtained on the smaller volume of the auxiliary reservoir alone, in this way assuring a high differential of brake pipe pressure to hold the service piston in release position.

Operation

125—*Q.—Describe the initial flow of brake pipe air at the BR control valve.* A.—Referring to Fig. 17, air from the brake pipe flows through the branch pipe combined dirt collector and cut out cock, through the filter *12* and to chambers *A* and *B* on the face of the service piston *93* and emergency piston *35.*

126—*Q.—What movement of the pistons then occurs?* A.—They both move to release position.

127—*Q.—With the service piston in this position what ports does it uncover?* A.—In this position the piston uncovers the charging choke *83* and charging ports *X* in the piston bushing.

128—*Q.—What communications are open between brake pipe and auxiliary reservoir via chamber A on the face of the service piston?* A.—(1)—Through choke *83* to service slide valve chamber *C,* thence through passage *5g,* release slide valve chamber *D* and passage *5* to the auxiliary reservoir. (2)—Through charging ports *X,* passage *5f,* choke *81,* past check valve *73,* passage *5g,* release slide valve chamber *D* and passage *5* to the auxiliary reservoir.

Tank Car Repairs Promptly Made

Railroads engaged in handling the East Coast petroleum movement are encountering delays to trains by reasons of cutting out tank cars enroute for various equipment defects. According to a circular letter recently issued by the A. A. R. Mechanical Division, an analysis on one railroad indicated a total of 4,262 cars shopped in one recent month. The defects for which these cars were shopped were as follows:

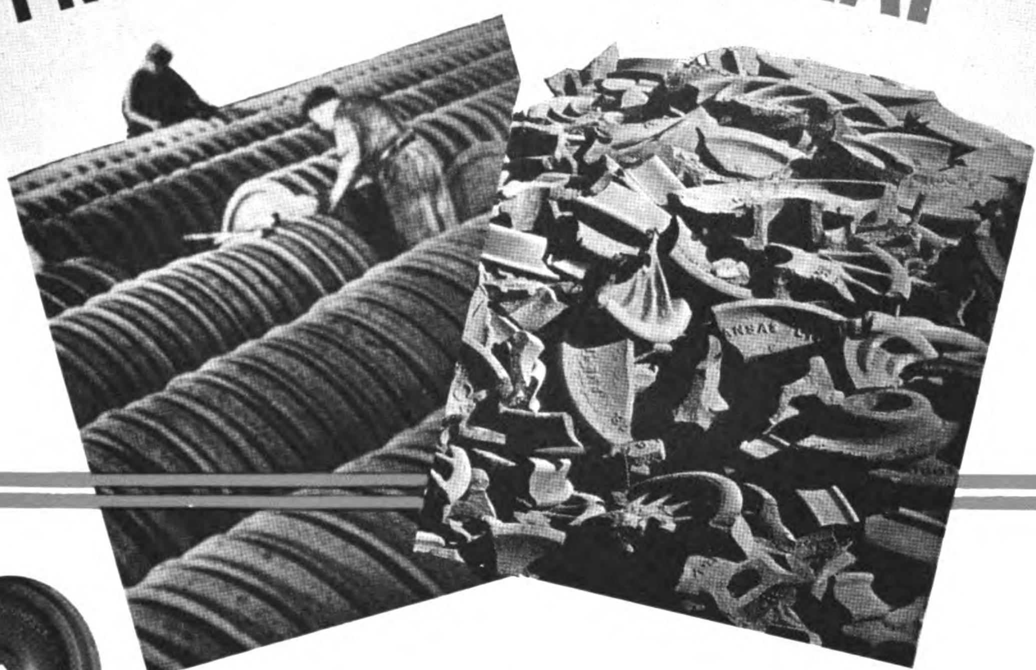
Trucks (other than wheels)	1,382 cars, or	32.4 per cent
Wheels, cast-iron	1,237 cars, or	29.0 per cent
Wheels, wrought-steel	5 cars, or	.0 per cent
Couplers, draft gears and attachments	596 cars, or	14.0 per cent
Air brakes	430 cars, or	10.1 per cent
Miscellaneous	612 cars, or	14.5 per cent
Total	4,262 cars, or	100.0 per cent

To overcome this situation, large accumulations of defective cars in the loading areas must be prevented

(*Continued on next left-hand page*)

VICTORY Demands VOLUME PRODUCTION

VOLUME PRODUCTION Requires SCRAP



The manufacture of chilled car wheels is no exception. Under our wheel exchange plan, by which you receive new wheels for old on a conversion charge basis, discarded chilled wheels are speedily melted and recast into new and better wheels for your freight cars.

You can help conserve vital metal, speed delivery of new chilled car wheels, keep defense production rolling to its destination and help hasten victory, by immediately returning every scrapped chilled car wheel to one of our foundries.

Make your scrap give the Axis a rap!

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

230 PARK AVENUE,
NEW YORK, N. Y.

445 N. SACRAMENTO BLVD.,
CHICAGO, ILL.

AMCCW

ORGANIZED TO ACHIEVE:
Uniform Specifications
Uniform Inspection
Uniform Product

and, as far as possible, the shopping of cars (both loaded and empty) while en route eliminated. The following procedure is recommended by the A. A. R., Mechanical Division.

Inspection Prior to Loading and After Unloading

All cars must receive a close inspection, prior to loading, either by the car owner or the railroad. Where the car owner has repair facilities available, all necessary repairs should be made by him to such an extent that the cars may reasonably be expected to carry their loads to destination without delay enroute for repairs or transfer. In the absence of repair facilities by the car owner, the railroad serving the industry must take cars to its nearest repair track and make all necessary repairs to the above extent.

All cars must receive just as close an inspection after being unloaded and, if defective, repaired to the same extent, as in the loading area. It is just as essential that the empty cars move to destination without shopping for mechanical defects during the trip as for the loaded cars to do so.

All tank cars found in a leaky condition at destination should be repaired before being returned to loading points. When repairs to the tank shell are required, due attention should be given to anchorage and to underframe when required. Effective at once, Interchange Rule 2 (Par. 3, Sec. (b)) is modified to read as follows:

"Any leaky tank car, regardless of commodity carried, shall have stenciled on both sides, in letters three inches in size, adjacent to the car number, the words 'Leaky tank. Do not load until repaired,' and at the location of the leak the symbol 'X'; and the owner shall be immediately advised *by wire,* stating definitely location of leak and point at which empty car is held. *Owner shall furnish disposition by wire within 48 hr.* Stenciling must not be removed until the tank is repaired. No charge shall be made for this stenciling."

Where it is found necessary to shop cars while in transit, repairs to an extent that car may reasonably be expected to move to destination without additional repairs, should be performed with the least delay possible.

Railroads should, as far as practical, confine their inspection to one point on the railroad where cars are received, and there provide facilities to condition the cars to go to destination without further detail inspection.

Scope of Inspection and Repairs

Particular attention is directed to the necessity for maintaining couplers and attachments, draft gears, brake beams, brake beam hangers, pins and other attachments, hand rails, air brake piping, side bearings and side bearing clearances, in a proper state of repair at all times.

The condition of uncoupling levers and attachments should be carefully checked, with special attention to any condition which may cause the coupler lock to lift accidentally as a result of longitudinal or lateral movement of the coupler head. Type *D* coupler lock lifters should be examined and the No. 3 type lifter applied to couplers not so equipped.

Dome covers, safety valves, outlet valves, outlet valve caps and heater pipe caps must be carefully checked. Many cases have been found where threads on the end of the outlet pipe are so badly worn it is practically impossible to hold the caps secured in their proper places. Air brakes must be checked to ascertain if in operative condition and not overdue for periodic attention.

Particular attention should be given to journal box packing. On cars not due for periodic repacking, the boxes should be carefully examined and packing adjusted or boxes repacked as found necessary. Free oil may be used in accordance with the instructions of individual railroads or car owner. This attention should also be given to loaded cars in train yards. When cars are overdue for periodic attention, it is important that the requirements of Rule 66 be fully complied with, using materials meeting the A.A.R. specifications for new car oil; renovated car oil; new waste for journal box packing and renovated journal box packing.

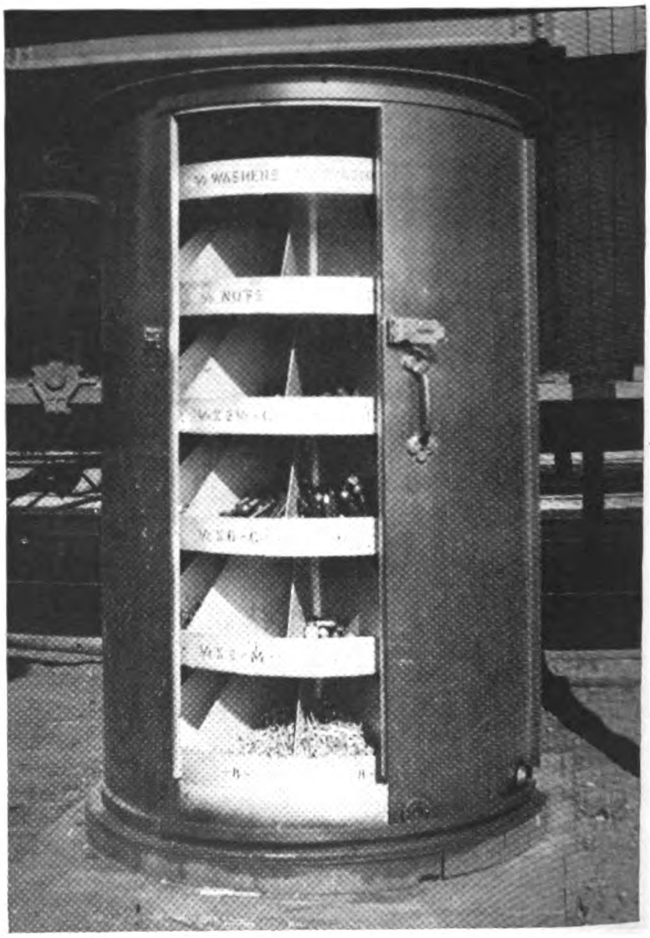
Substitutions of Materials

Full advantage should be taken of substitution of materials as provided for in the A.A.R. Interchange Rules, rather than to hold cars out of service awaiting material. Particular attention is directed to new sections (m), (n) and (o) of Rule 17 appearing in Supplement No. 1 to the current Code of Rules with respect to bolsters, side frames and safety supports. Also, to modified Rule 23 which will appear in Supplement No. 2, effective September 1, 1942, and will permit more extensive repairs to car parts by welding.

When necessary to order materials from car owner during the present emergency, such orders should be submitted by wire and shipment must be made without delay via express or truck.

The Mechanical Division suggests that railroads survey their operation to ascertain if certain items (such as side frames or bolsters) are failing to an extent where it would expedite car movement if the owner would stock these items at strategic points on the railroad and arrange with the car owner to do so.

* * *



A small circular material rack built of light steel which is particularly suitable for use out of doors—The door slides on rollers and the shelves are supported by a vertical telescoping pillar which permits them to rotate easily on ball bearings—A hasp is provided for the padlock—The rack is in use on the Great Northern

(Turn to next left-hand page)

High Spots in
Railway Affairs . . .

Woman Workers On Railroads

Increased railroad business, the selective service draft, and opportunities in the war industries, are making the personnel problem on the railroads one of increasing difficulty. More and more women are being taken into the service in those occupations for which they are best equipped. It appears now, however, that it will be necessary to use women in some of the heavier occupations, in which they have not ordinarily functioned, or at least since the first World War. The British railways were forced to take this step a long time ago. The Office of Defense Transportation, on September 15, sent Dorothy M. Sells, chief of the Personnel Supply Section of the Division of Transport Personnel, to England, to make a first-hand study of how the women are being used in the British transportation industry. It is expected that this survey will require at least two months.

Oil for the East Coast

For the week ended September 5 the railroads handled an average of 824,850 barrels of oil daily to the East Coast. This is a far cry from the 1941 average of only 11,250 barrels of oil per day—a really spectacular and outstanding accomplishment, considering the condition of the railroad tank car equipment and all of the operating problems involved, at a time when the railroads are being forced to handle a record-breaking freight and passenger business. Even with this remarkable improvement there promises to be a shortage of oil for heating purposes on the East Coast this winter. The construction of pipe lines is being rushed, in order to shorten the hauls of the railroad tank cars, and this promises to bring some relief, if the job can be completed before extreme cold weather sets in.

No Football Specials

Director Eastman of the Office of Defense Transportation, issued a statement on September 13 to the effect that no special train or bus service to football games or other sports events will be permitted this fall and winter. He also indicated that his office was taking steps to prevent the overcrowding of regular trains serving areas in which such events are to be held. Passenger travel on public carriers has increased 100 per cent over a year ago and week-end congestion on both trains and buses has become a serious problem in all parts of the country. "For these reasons," says Mr. Eastman, "the customary heavy train and bus travel to football games and similar events is out of the question this year." The colleges are being asked to co-operate in making arrangements for the transfer of scheduled games to centers of population, so that a minimum of transportation will be required.

Traffic in 1943

M. J. Gormley, executive assistant of the Association of American Railroads, in an address before the Great Lakes Regional Advisory Board, predicted an increase in railroad passenger and freight traffic in 1943 of 15 per cent over 1942. Incidentally, Mr. Gormley estimates that the railroad freight traffic in 1942, measured by the number of tons hauled one mile, will be about 30 per cent greater than in 1941, and that the railroad passenger business, measured by the number of passengers carried one mile, will be approximately 50 per cent greater this year than in 1941. On this basis, the estimated increase next year will not be as great as the increase in traffic in 1942 over 1941. Mr Gormley pointed out that, "War production is certain to increase. Troop movements will increase as our army and navy are enlarged. Passenger business will go up as the use of rubber-tired and gasoline-driven vehicles decreases. The railroads will continue to handle such unaccustomed loads as the oil movement to the East and the all-rail movement of coal into New England. On the other hand, civilian production will probably fall to minimum levels in 1943."

Post-War Planning

We have changed from a peace-time to a war-time economy. If we are to meet the 1943 program for war materials it will require such a large part of our production facilities that we shall have to reduce our standard of living to almost a bare subsistence basis, although, fortunately, we will be able to coast along fairly well for some time on our present facilities and conveniences. When peace comes we shall have to make a drastic shift back to a new economy. Returning service men must be given employment and, in fact, if we are to enjoy prosperity we must effectively solve the unemployment problem. We did not make a very good job of this in pre-war days, and certainly we must make a better job of it when the war is over. In spite of the demands of the present war emergency, there are today in this country well over 100 organizations, governmental and private, that are engaged in post-war planning; this does not take into consideration a great number of individual industries that are engaged in special research and planning in their own specific fields. Some of these companies have large staffs busily engaged on such studies. Because of political factors that may enter into the situation, it behooves all intelligent people in this country to take an interest in these matters, so that when they come up for public discussion, wise counsel will prevail and politicians, ignorant of the economic principles involved or out to feather their own nests, may be curbed.

Train-Limit Laws Canceled

Railroad operation, even under normal conditions, has been hampered by train-limit laws, adopted by some of the states. Under war conditions they have seriously affected the efficiency of operation. In an order, effective September 15, the Interstate Commerce Commission directed the railroads to disregard these state train limit-laws "when necessary for the prompt movement of freight and the clearing or avoidance of congestion by either freight or passenger trains". Only the states of Oklahoma and Arizona are affected. It is understood that the Office of Defense Transportation is in agreement with the I. C. C. action.

Railroad Executive Rubber Administrator

This country was caught badly off its guard in not having made early and more adequate provisions to insure a reasonable supply of rubber for war and civilian purposes. Conditions have become such that it is necessary to take drastic action. A special investigating committee, appointed by the President and consisting of Bernard M. Baruch, chairman; James B. Conant, president of Harvard University, and Karl T. Compton, president of Massachusetts Institute of Technology, recommended that the WPB appoint as rubber administrator a man of "unusual capacity and power," giving him "full and complete authority in regard to the manufacture of synthetic rubber, including research, development, construction and operation of plants." It is a tough job and at this juncture no chances can be taken in experimenting with a man about whose ability or performance there is any question. Donald M. Nelson, chairman of the War Production Board, in selecting a man "who can do any kind of a tough job," turned to William M. Jeffers, president of the Union Pacific. The appointment was made on September 15 and Mr. Jeffers immediately started to work to lick the problem —a problem which, at the moment, is undoubtedly about the toughest with which any one man in this country can be confronted.

(*Turn to next left-hand page*)

Among the Clubs and Associations

American Society of Mechanical Engineers

Election of Officers

Harold V. Coes, vice-president of Ford, Bacon & Davis, Inc., New York, has been elected president of the American Society of Mechanical Engineers for the year 1943. Vice-presidents elected to serve two-year terms on Council are Joseph W. Eshelman, president, Eshelman & Potter, Birmingham, Ala.; Thomas E. Purcell, general superintendent of power stations of the Duquesne Light Company, Pittsburgh, Pa.; Guy T. Shoemaker, vice-president, Kansas City Light & Power Company, Kansas City, Mo.; Walter J. Wohlenberg, professor of mechanical engineering, Yale University, New Haven, Conn.

Managers elected to serve on Council for three-year terms include Roscoe W. Morton, professor of mechanical engineering and head of the department, University of Tennessee, Knoxville, Tenn.; Alexander R. Stevenson, Jr., staff assistant to vice-president, General Electric Company, Schenectady, N. Y., and Albert E. White, director engineering research, University of Michigan, Ann Arbor, Mich.

The new officers will be installed during the sixty-third annual meeting of the society to be held in New York at the Hotel Astor, November 30 to December 4, 1942.

Railroad Division

In accordance with usual procedure, the annual meeting of the Railroad Division of the A. S. M. E., scheduled for December 3, will be presided over by the present chairman, D. S. Ellis, chief mechanical officer, Chesapeake & Ohio. The position of chairman for the ensuing year will be filled by J. R. Jackson, engineer of tests, Missouri Pacific. At an all-committee meeting, held on June 9 in Cleveland, Ohio, W. C. Sanders, general manager, Railroad Division, Timken Roller Bearing Company, was elected incoming new member of the five-man Executive Committee.

By poll of the Executive, General and Advisory committees of the Railroad Division, the following three men have recently been elected incoming members of the General committee, each for a term of five years: J. M. Nicholson, mechanical assistant to vice-president, Atchison, Topeka & Santa Fe, Chicago; P. W. Kiefer, chief engineer motive power and rolling stock, New York Central, New York; and E. D. Campbell, general mechanical engineer, American Car and Foundry Company.

Northwest Locomotive Association.—Meeting October 19 at 8 p. m. at Woodruff Hall, St. Paul, Minn. Speaker: P. D. Blanchard, service engineer, The Superheater Company. Subject: The Production and Utilization of Superheated Steam.

New England Railroad Club.—Meeting October 13 at the Hotel Touraine, Boston, Mass., starting with dimer at 6:30 p. m. Speaker: W. C. Kendall, chairman, Car Service Division, A. A. R. Subject: Handling of War-Time Traffic.

A. A. R. Mechanical Division Committee Changes

The A. A. R., Mechanical Division, has announced the changes in the personnel of its committees as they have been effected to serve the division until June, 1943. There are no changes in the officers of the division, who are W. H. Flynn (chairman), general superintendent motive power and rolling stock, New York Central; R. G. Henley (vice-chairman), general superintendent motive power, Norfolk & Western; V. R. Hawthorne, executive vice-chairman; A. C. Browning, secretary, and W. I. Cantley, mechanical engineer. The following are the new members on each of the committees:

General Committee

H. W. Jones, chief motive power, Pennsylvania, Philadelphia, Pa. (succeeding F. W. Hankins, assistant vice-president, operations, Pennsylvania System, Philadelphia, Pa.)

J. M. Nicholson, assistant to vice-president, A. T. & S. F., Chicago (succeeding J. Purcell, assistant to the operating vice-president, A. T. & S. F.—retired.)

P. O. Christy, general superintendent equipment, Illinois Central, Chicago (succeeding G. C. Christy, general superintendent of equipment, Illinois Central—retired.)

H. P. Allstrand, chief mechanical officer, C. & N. W., Chicago (succeeding E. B. Hall, chief mechanical officer both of the C. & N. W. and the C. St. P. M. & O.—retired.)

B. M. Brown, general superintendent motive power, Southern Pacific, San Francisco, Calif. (succeeding George McCormick, general superintendent motive power, Southern Pacific—retired.)

A. K. Galloway, general superintendent motive power and equipment, B. & O., Baltimore, Md.

Nominating Committee

J. M. Nicholson, assistant to vice-president, A. T. & S. F., Chicago (succeeding J. Purcell.)

H. P. Allstrand, chief mechanical officer, C. & N. W., Chicago, (succeeding E. B. Hall.)

H. W. Jones, chief motive power, Pennsylvania, Philadelphia, Pa., (succeeding F. W. Hankins.)

Arbitration Committee

W. N. Messimer, assistant superintendent of equipment, New York Central, New York (succeeding W. H. Flynn.)

E. L. Bachman, general superintendent motive power, Pennsylvania, New York (succeeding W. R. Elsey, assistant to the vice president in charge of real estate, purchases and insurance, Pennsylvania, Philadelphia, Pa.)

Sub-Arbitration Committee

C. J. Hayes, supervisor of A. A. R. Billing Bureau, New York Central, Buffalo, N. Y. (succeeding W. N. Messimer.)

Prices for Labor and Materials

No changes.

Car Construction

R. B. Winship, mechanical engineer, Canadian Pacific, Montreal, Que. (succeeding W. A. Newman, chief mechanical engineer, Canadian Pacific, Montreal, Que.)

Brakes and Brake Equipment

F. T. McClure, supervisor air brakes, A. T. & S. F., Topeka, Kan. (succeeding J. A. Burke, supervisor air brakes, A. T. & S. F.—deceased—who has been succeeded as vice-chairman by J. P. Lantelme, general foreman, Pennsylvania, Philadelphia, Pa.)

A. J. Pichetto, general air brake engineer, Illinois Central, Chicago.

Couplers and Draft Gears

F. T. James, chief motive power, D. L. & W., Scranton, Pa. (succeeding E. E. Root, chief motive power, D. L. & W., who is now on a leave of absence.)

Loading Rules

G. D. Minter, division car inspector, N. & W., Portsmouth, Ohio (succeeding R. H. Dyer, general car inspector, N. & W., Roanoke, Va.)

Locomotive Construction

L. P. Michael, chief mechanical engineer, C. & N. W., Chicago (succeeding H. P. Allstrand, who has been succeeded as vice-chairman by E. L. Bachman, general superintendent motive power, Pennsylvania, New York.)

Safety Appliances

H. W. Jones, chief motive power, Pennsylvania, Philadelphia, Pa. (succeeding F. W. Hankins.)

J. M. Nicholson, assistant to vice-president, A. T. & S. F., Chicago (succeeding J. Purcell.)

Specifications for Materials

No changes.

Tank Cars

L. R. Schuster, engineer car construction, Southern Pacific, San Francisco, Calif. (succeeding, B. M. Brown, general superintendent motive power, Southern Pacific.)

D. S. Clark, administrative assistant, School of Mechanical Engineering, Purdue University, Lafayette, Ind. (succeeding G. A. Young, School of Mechanical Engineering, Purdue University.)

G. W. Thomas, master car builder, Deep Rock Oil Corp., Cushing, Okla. (succeeding W. C. Steffa, transportation manager, Sinclair Refining Company, New York.)

Wheels

F. Holsinger, wheel shop foreman, Marckham shop, Illinois Central, Hazelcrest, Ill.

Lubrication of Cars and Locomotives

No changes.

Further Development of Reciprocating Steam Locomotive

A. J. Townsend, mechanical engineer, Lima Locomotive Works, Inc., Lima, Ohio (succeeding W. E. Woodard, vice-president, Lima Locomotive Works—deceased.)

R. P. Johnson, chief engineer, Locomotive Division, Baldwin Locomotive Works, Philadelphia, Pa. (succeeding W. H. Winterrowd, vice-president, Baldwin Locomotive Works—deceased.)

J. E. Davenport, vice-president, engineering, American Locomotive Company, New York (succeeding J. B. Ennis, senior vice-president, American Locomotive Company.)

Joint Committee on Utilization of Locomotives

No changes.

Journal Bearing Development (New Committee)

W. I. Cantley (chairman), mechanical engineer, Association of American Railroads, Chicago.

J. R. Jackson, engineer of tests, Missouri Pacific, St. Louis, Mo.

J. W. Hergenhan, assistant engineer, test department, New York Central, New York.

J. Mattise, general air brake instructor, C. & N. W., Chicago.

L. B. Jones, engineer of tests, Pennsylvania, Altoona, Pa.

C. B. Bryant, engineer of tests, Southern, Alexandria, Va.

Committee on Geared Handbrakes (New Committee)

R. G. Henley (chairman), general superintendent motive power, N. & W., Roanoke, Va.

E. P. Moses, engineer rolling stock, New York Central, New York.

J. P. Lantelme, general foreman, Pennsylvania, Philadelphia, Pa.

W. I. Cantley, mechanical engineer, Association of American Railroads, Chicago.

(Turn to next left-hand page)

NEWS

B & O.'s new No. 1 goes into regular freight service

B. & O. Operates First Diesel Freight Locomotive in East

THE first Diesel-electric freight locomotive to be operated on an Eastern railroad was placed in service by the Baltimore & Ohio at Chicago on August 31. The 5,400-hp. locomotive was delivered by the Electro-Motive Division of General Motors Corporation a week previously and had been tested on the Chicago-Akron division. It left the Barr yards at Chicago on August 31, with a train of 76 loaded oil cars and a dynamometer car for an 805-mile non-stop run to Baltimore, Md.

ODT Appointment

CHARLES J. WOLFE, superintendent of motive power of the Western Maryland, has been appointed associate director of the Office of Defense Transportation's Division of Railway Transport, in charge of the Mechanical Section.

Lima Extends Its Tank Plant

LIMA Locomotive Works, Inc., is completing the equipment of an extension to its tank arsenal at Lima, Ohio, which will be in production well before the end of the year. The expansion will represent an increase of 80 per cent in the size of the tank plant. When it is in full production, the company will be producing five times as many tanks as were contemplated when the original tank plant was built in 1941.

Lima's tank arsenal built the first of the M-4 type tanks. This was christened at the Lima plant on January 27, 1942. It is of cast-steel and welded construction, and numbers like it which have since been turned out from this plant have already been subjected to the test of actual combat. The Lima tank arsenal is entirely separate from the locomotive plant which is also engaged in the manufacture of cranes, power shovels, and drag lines, as well as machine-tool parts and parts of other war equipment on a sub-contracting basis. The plant is now engaged 100 per cent in war work.

Conservation of Rubber In Air-Brake Hose

ON page 312 of the July, 1942, *Railway Mechanical Engineer* are reproduced instructions issued by the A. A. R. Mechanical Division for reclaiming air-brake hose by splicing. The drawing which accompanies this article illustrates a malleable-iron joiner to be used in splicing the air-brake hose.

A case has been reported in which some car owner is using shop-made joiners made from pipe stock which do not meet the requirements and which allow the hose to move on the fitting. The Mechanical Division states that this practice cannot be tolerated, as it will result in spliced hose pulling off the fitting and delaying trains and much needed equipment. It is urged that for the purpose of splicing air-brake hose, all car owners and repairing lines use malleable-iron joiners meeting fully all of the dimensional requirements shown on the drawing referred to.

Pelley Sees Shortage of Engines

TESTIFYING before a special unofficial House committee investigating the petroleum situation on the east coast on August 31, J. J. Pelley, president of the Association of American Railroads, declared that the railroads would be doing well if they can maintain a daily movement of 800,000 barrels of oil to the east during the coming fall and winter months. He went on to explain to the committee that the bottleneck, if any, will come in a lack of locomotives rather than in the ability to obtain the necessary tank cars. He pointed out that because of the shortage of steel and other materials, the railroads would come up to the end of this year with 400 to 500 fewer locomotives than they had on order.

New Programs Said to Call for 900 Locomotives, 80,000 Cars

A PROPOSED program calling for the construction of 80,000 additional freight cars and 900 locomotives needed to handle the increased volume of traffic anticipated next year is reported to be in the hands of the War Production Board. The program is reportedly based on estimates that ton-miles in 1943 will increase 15 per cent over 1942 and that active cars will increase with a rise in ton-miles in the ratio of 1 to 3. To effect a net increase of 80,000 cars, the program should include an additional number to compensate for cars to be retired during the period, but, recognizing the critical-materials situation, it is reported to have been held to 80,000.

Of these, 3,500 will be box cars and 76,500 open-top cars. The latter include 10,000 flat cars, 2,000 covered hopper cars, 25,000 hopper cars, 35,000 gondola cars and 4,500 ore cars.

(*Continued on next left-hand page*)

Orders and Inquiries for New Equipment Placed Since the Closing of the August Issue

LOCOMOTIVE ORDERS

Road	No. of Locos.	Type of Locos.	Builder
Lehigh Valley	5	1,000-hp. Diesel-elec.	Electro-Motive Corp.
	5	1,000-hp. Diesel-elec.	American Loco. Co.
Norfolk & Western	5[1]	2-6-6-4	Company Shops

LOCOMOTIVE INQUIRIES

New York Central	25	4-8-2	....

FREIGHT-CAR ORDERS

Road	No. of Cars	Type of Car	Builder
Carnegie-Illinois Steel Corp.	80	100-ton gondola	American Car & Fdry. Co.
Denver & Rio Grande Western	780[2]	Gondola	Pressed Steel Car Co.
Dow Chemical Company	2[2]	Tank	American Car & Fdry. Co.
General Electric Co.	1[2]	Hopper	American Car & Fdry. Co.
Missouri Pacific	50[2]	Hopper	American Car & Fdry. Co.
Union Pacific	1,000[2]	Gondola	Pull-Std. Car Mfg. Co.

FREIGHT-CAR INQUIRIES

Carnegie-Illinois Steel Corp.	18	70-ton gondolas
	10	50-ton flat
Colorado Fuel & Iron Corp.	30	75-ton ore
Norfolk & Western	100[3]	70-ton gondola
	25[3]	70-ton flat
Republic Steel Corp.	20-125	70-ton hopper

[1] Authorization received from the War Production Board, provided necessary materials can be secured as required, the N. & W. expects to complete two in January, one in February and two in March.
[2] Release issued by the War Production Board.
[3] Subject to approval of the War Production Board.


AMERICA'S ANSWER
61
TEAMWORK
"Tain't the guns n'r armament,
nor the army as a whole,
But th' everlastin' teamwork
of ev'ry bloomin' soul."
— Kipling
All of General Motors' resources — its men . . . its machines . . . its 90-odd plants . . . its Management . . . are dedicated to producing a constantly increasing flow of war tools to "Keep 'em Rolling"—"Keep 'em Flying" — "Keep 'em Fighting" . . . because
VICTORY IS OUR BUSINESS
540
540
GENERAL MOTORS LOCOMOTIVES
ELECTRO-MOTIVE DIVISION
GENERAL MOTORS CORPORATION LA GRANGE, ILLINOIS, U.S.A.

This new equipment-building program for the railroads is reported to cover the year October, 1942-43, although, at the current lagging rate of operation in the car-building industry, it is doubtful that the 1942 program will be completed by October 1. If the views of some railroad officers prevail, who believe that employment in the car-building industry should be made continuous, and production schedules placed on a monthly basis, the new program will get under way as quickly as possible. The industry is known to be concerned over the dispersal of its workers.

Railroads Get 16,024 of Final 18,000 Freight Cars

FINAL allocation of the 18,000 cars authorized by the War Production Board to complete the 1942 car-building program shows 16,024 of the cars were released to railroads and 1,976 to private car lines. Of the total, 11,676 will be built by contract car builders and 6,324 in railroad company shops.

As of September 1, there were 14,275 cars authorized for 1942 construction yet to be delivered, including 965 remaining of the original 36,000 authorized by the former Supply, Priorities and Allocations Board and 13,310 remaining of the additional 18,000 authorized by the WPB. Of the 965 left in the SPAB program, 601 (260 gondola, 89 hopper and 252 tank cars) are on order with contract car builders and 364 hopper cars with railroad company shops, while the 13,310 left in the WPB program include 9,985 on order with contract car builders and 3,325 with railroad company shops. Deliveries under the programs are reported to be lagging seriously, especially in car building plants, due to continued materials' shortages.

The allocation of the cars by railroads and builders is shown in the accompanying table.

Allocation of Final 18,000 Freight Cars Authorized by WPB to Complete 1942 Construction

Name of Railroad	No.	Type	Builder
Atlantic Coast Line	172	Flat	Greenville Steel Car
	300*	Gondola	Bethlehem Steel Co.
Bessemer & Lake Erie	150	Gondola	Greenville Steel Car
	20	Gondola	Pressed Steel
	93	Hopper	Pullman-Standard
Birmingham Southern	86	Gondola	
Central of New Jersey	500*	Gondola	Bethlehem Steel Co.
	246	Hopper	Company Shops
	50	Cov. Hopper	American Car & Foundry
Chesapeake & Ohio	130	Hopper	
Chicago & North Western	25	Flat	Company Shops
	250	Flat	Pullman-Standard
Chicago, Burlington & Quincy	400	Flat	Company Shops
	500*	Hopper	
	50	Cov. Hopper	
Chicago, Milwaukee, St. Paul & Pacific	2	Flat	Company Shops
Chicago, Rock Island & Pacific	300	Flat	
Delaware & Hudson	80	Hopper	
Denver & Rio Grande Western	780	Gondola	Pressed Steel
Detroit, Toledo & Ironton	50	Flat	Greenville Steel Car
Duluth, Missabe & Iron Range	500	Ore	Pullman-Standard
	500	Ore	General American
	500	Ore	American Car & Foundry
Elgin, Joliet & Eastern	200	Flat	Ralston
	500*	Gondola	American Car & Foundry
	200	Gondola	General American
Great Northern	500	Ore	Bethlehem Steel Co.
Lehigh Valley	960*	Hopper	
Louisville & Nashville	100	Flat	Mount Vernon Car
	100	Cov. Hopper	American Car & Foundry
Missouri Pacific	570	Gondola	Pressed Steel
	100	Cov. Hopper	American Car & Foundry
Nashville, Chattanooga & St. Louis	50	Cov. Hopper	
New York Central	303	Flat	Despatch Shops
	1,100*	Gondola	
New York, Chicago & St. Louis	50	Flat	Pullman-Standard
	50	Cov. Hopper	American Car & Foundry
New York, New Haven & Hartford	13	Flat	Company Shops
Norfolk & Western	200	Hopper	Virginia Bridge
Northern Pacific	489	Hopper	American Car & Foundry
Pennsylvania	22	Flat	Company Shops
	1,000	Gondola	
	797	Hopper	
Pere Marquette	250	Flat	Greenville
Reading	300	Gondola	Company Shops
	300	Hopper	
St. Louis Southwestern	50	Flat	
Southern Pacific	10	Flat	
	90	Gondola	
Union Pacific	1,000*	Gondola	Pullman-Standard
Virginian	100	Gondola	Company Shops
	536	Hopper	
Wabash	100	Gondola	
Western Pacific	300	Flat	Mount Vernon Car
Shippers Car Line	3	Flat	American Car & Foundry
	22	Cov. Hopper	
	786	Tank	
Various Other Private Car Lines	1	Cov. Hopper	
	605	Tank	
	559	Tank	General American
Total	18,000		

* Composite wood and steel construction.

Supply Trade Notes

WILLIAM N. MANUEL, manager of the general sales service department of the Corning Glass Works, Corning, N. Y., retired on September 1, after 25 years of service with that company.

◆

ALLEGHENY-LUDLUM STEEL CORPORATION.—*W. G. McFadden* has been appointed acting manager of the Chicago office of the Allegheny-Ludlum Steel Corporation to replace *P. E. Floyd*, now serving with the government.

◆

WILLIAM E. VOGT has been elected secretary of Electro Metallurgical Sales Corporation, a unit of the Union Carbide & Carbon Corporation, with headquarters in the company's New York offices. Mr. Vogt has been with units of the Union Carbide & Carbon Corporation for more than 30 years.

Army-Navy Production Awards

Recognition of high achievement in the production of war equipment has been made by the presentation of the Army-Navy "E" to the following companies:

The Armstrong Bros. Tool Company, Chicago. September 15.

The International Nickel Company, Huntington, W. Va. All-Navy "E"—awarded for second time.

Jones & Lamson Machine Co., Inc., Springfield, Vt. August 24.

Ohio Injector Company, Wadsworth, Ohio. August 26.

Pressed Steel Car Co., Inc., Hegewisch, Ill. September 9.

William Sellers and Company, Philadelphia, Pa. September 11.

Vermont Foundries, Inc., Springfield, Vt. August 24.

CHARLES H. McCREA, first vice-president, of the National Malleable & Steel Castings Company, has been elected president, succeeding Carl C. Gibbs, deceased.

◆

LANDIS MACHINE COMPANY.—*G. N. Kirkpatrick*, vice president and general manager of the Landis Machine Company, Waynesboro, Pa., has been appointed president. Mr. Kirkpatrick will continue also as general manager. *G. M. Stickell*, sales manager has been appointed vice president and will continue also as sales manager.

◆

JOHN F. VAN NORT, sales manager, Western division of the Duff-Norton Manufacturing Company, Pittsburgh, Pa., with headquarters at Chicago, has been promoted to general sales manager at Pittsburgh. Mr. Van Nort was born at

(*Continued on next left-hand page*)

Fairmont, W. Va., on July 27, 1898, and began his business career in 1922 as a salesman with the Oil Well Supply Company (a subsidiary of the United States Steel Corporation) at Pittsburgh, Pa. He later served in various capacities in the sales department of that company, including those of branch store manager and

John F. Van Nort

special representative of the Eastern division. In 1934 Mr. Van Nort became manager of Pittsburgh sales, with headquarters at Pittsburgh, which position he held until 1941, when he resigned to become Western division sales manager of Duff-Norton.

Obituary

Earl Hammond Fisher, assistant to the president of the Wine Railway Appliance Company and assistant to the vice-president of the Unitcast Corporation, Toledo, Ohio, who died on August 9, as reported in the September issue, began his career with the Norfolk & Western at Roanoke, Va. He served as chief clerk to master boilermaker from March, 1914, to July, 1915, and as a draftsman, motive power, from July, 1915, to July, 1916. He subsequently was engaged as a draftsman for the Colorado & Southern at Denver, Colo., from July to September, 1916; as a draftsman for the Chicago, Rock Island & Pacific at Silvis, Ill., from September, 1916, to July, 1917, to December, 1918, and as a locomo-Union Pacific at Omaha, Nebr., from July, 1917, to December, 1918. and as a locomotive designer for the Norfolk & Western from December, 1918, to March, 1921. He was associated with the Hanna Locomotive Stoker Company, Cincinnati, Ohio, as mechanical engineer from March, 1921, to February, 1923, and with the T. H. Symington Company, East Rochester, N. Y., as special designer from February to April, 1923. He joined the Wine Railway Appliance Company in April, 1923, as mechanical engineer; in January, 1926, was appointed sales engineer and in July, 1939, became assistant to the president, Wine Railway Appliance Company, and assistant to the vice-president, Unitcast Corporation.

◆

Harry T. Thompson, district manager of the Metal & Thermit Corp., died on August 19. He was 53 years of age. Mr. Thompson was a graduate of the Georgia Institute of Technology (1912). During World War I he served in France as a captain in the field artillery. After returning to civilian life, he became associated with the Differential Steel Car Company, Findlay, Ohio, and later became a vice-president and director of the company, continuing in these positions until his death. He joined the sales organization of the Metal & Thermit Corporation in 1931. Shortly thereafter, he was appointed district manager and placed in charge of the company's Pittsburgh, Pa., branch, which serves the central Atlantic and southeastern states.

◆

Henry Etter Passmore, railway supply representative at Pittsburgh, Pa., died July 5. Mr. Passmore was 72 years of age. He was educated at the York (Pa.) Collegiate Institute and the Maryland Institute. He entered railway service in 1886 as a machinist apprentice of the Northern Central at Baltimore, Md. At the completion of his apprenticeship, he continued as a machinist on the Northern Central for a year and then entered the employ of the Norfolk & Western as a machinist, subsequently becoming gang foreman and division shop foreman. He was track foreman of the Baldwin Locomotive Works from 1896 to 1898; general foreman of the Philadelphia & Reading, 1898-99; assistant master mechanic of the Western Maryland, 1899 to October, 1902, and superintendent motive power and equipment, Detroit Southern, 1902 to April, 1903. He was appointed master mechanic of the Toledo & Ohio Central in 1903, and in October, 1913, entered the sales department of the Grip Nut Company. He went to Pittsburgh as sales manager of the Davis Brake Beam Company in August, 1925. At the time of his death he was railway supply representative of the Frost Railway Supply Company, the Koppers Company—American Hammered Piston Ring division, and the Slaymaker Lock Company.

◆

Carl C. Gibbs, president of the National Malleable & Steel Castings Company, died suddenly at his home in Shaker Heights, Ohio, on September 9. Mr. Gibbs was born in Rush county, Ind., on October 10, 1882. He received a high school and commercial college education and began his

Carl C. Gibbs

career with the National Malleable & Steel Castings Company as secretary to the sales manager of the Indianapolis, Ind., works in 1906. From 1910 to 1919, he was a salesman at the Indianapolis plant, and in 1919 became sales manager of the company's Cleveland, Ohio, works. He returned to Indianapolis in the following year as manager of that plant, and in 1929 was appointed assistant to the president. In 1934 he was elected president. At the time of his death, Mr. Gibbs was a director of the Railway Business Association, having been elected a member of the governing board in November, 1935.

Personal Mention

General

E. L. Cook, assistant mechanical engineer of the Seaboard Air Line at Norfolk, Va., has been appointed mechanical engineer, with headquarters at Norfolk.

F. L. Kartheiser, chief clerk, mechanical department, of the Chicago, Burlington & Quincy, has been appointed to fill the newly created position of assistant to vice-president (operation), at Chicago. Mr. Kartheiser is secretary-treasurer of the Car Department Officers' Association.

Frank E. Russell, Jr., assistant superintendent of motive power of the Southern Pacific at Los Angeles, Calif., has been called to military service as a lieutenant colonel in the U. S. Army.

M. Wilkinson, supervisor maintenance of equipment of the Texas & Pacific at Dallas, Tex., has been appointed mechanical inspector, with headquarters at Dallas.

L. A. Porter, mechanical engineer of the Seaboard Air Line at Norfolk, Va., has been appointed assistant to general superintendent motive power, with headquarters at Norfolk.

(*Turn to next left-hand page*)

F. R. HOSAK, mechanical superintendent of the Missouri Pacific at St. Louis, Mo., has been called to military service.

G. O. WILLHIDE, master mechanic of the Western Maryland at Hagerstown, Md., has been appointed acting superintendent motive power, with headquarters as before at Hagerstown.

MILTON C. PRENTISS, who was appointed engineer of motive power of the New York, Ontario & Western with headquarters at Middletown, N. Y., as announced in the September issue of the *Railway Mechanical Engineer,* was born on May 27, 1900, at Greenville, Me. Mr. Prentiss received his bachelor of science degree in mechanical engineering from the University of Maine in 1923 and entered railroad service on September 21, 1924, with the New York, New Haven & Hartford, serving as special apprentice and mechanical inspector at the Readville locomotive shops. He then became enginehouse foreman and traveling locomotive inspector, successively, for the Boston & Maine, leaving that road to go with the planning department, Railway division, Edward G. Budd Manufacturing Company. Mr. Prentiss then went with the Baldwin Locomotive Works in the materials department, subsequently becoming factory engineer for the Philco Radio & Television Company. Mr. Prentiss then became sales engineer for the Gulf Oil Corporation.


Milton C. Prentiss

F. H. COWAN has been appointed supervisor maintenance of equipment of the Texas & Pacific, with headquarters at Dallas, Tex.

G. T. CALLENDER, superintendent of shops of the Missouri Pacific at Sedalia, Mo., has been appointed acting mechanical superintendent, Western district, with headquarters at St. Louis, Mo.

H. T. COVER, superintendent of freight transportation, Eastern region, of the Pennsylvania, has been appointed general superintendent of the Eastern Ohio division, with headquarters at Pittsburgh, Pa. A photograph and detailed sketch of Mr. Cover's career appeared on page 89 of the February *Railway Mechanical Engineer* at the time he became superintendent of freight transportation. Mr. Cover entered the service of the Pennsylvania first as a laborer and then as a boilermaker's helper. After successive promotions in the mechanical department to the position of master mechanic of the Columbus, Cincinnati, and Toledo divisions, he became superintendent of the Wilkes-Barre division at Sunbury, Pa., and then superintendent of freight transportation at Philadelphia.

RAY L. REX, who has been appointed mechanical assistant of the New York, Ontario & Western at Middletown, N. Y., as announced in the September *Railway Mechanical Engineer,* was born on May 2, 1901, at Lehighton, Pa. Mr. Rex served with the A. E. F. in France in 1918 and in 1919 went with the New Jersey Zinc Company Laboratory. He entered railway service on June 1, 1920, with the Lehigh Valley as a boilermaker helper at the Lehighton enginehouse, becoming a machinist apprentice in September, 1920. In September, 1924, Mr. Rex became machinist, then serving successively as time study engineer and piece-rate setter, dumper-plant engineer at Perth Amboy, N. J., chief engineer, and plant engineer and general foreman of locomotive and car shops at Perth Amboy.


Ray L. Rex

Master Mechanics and Road Foremen

G. E. JOHNSON, master mechanic of the Chicago, Burlington & Quincy at Havelock, Neb., has retired.

B. O'DONNELL, shop superintendent of the New York, Chicago & St. Louis at Lima, Ohio, has become assistant master mechanic, with headquarters at Lima.

G. A. MCLAIN, fireman of the New York, Chicago & St. Louis at Frankfort, Ind., has been appointed assistant road foreman of engines, of the Clover Leaf district.

O. M. HOENSHELL, road foreman of locomotives of the Chicago, Burlington & Quincy at Lincoln, Neb., has been appointed assistant master mechanic, with jurisdiction over the Omaha division. Mr. Hoenshell's headquarters are at Havelock, Neb.

A. R. NELSON, superintendent of shops of the Union Pacific at Pocatello, Idaho, is now master mechanic at Pocatello.

J. M. KLINE, special duty engineman on the Logansport division of the Pennsylvania, has been appointed assistant road foreman of engines, Cleveland division.

H. M. JOHNSON, engineer of the Toledo division of the New York, Chicago & St. Louis, has been appointed road foreman of engines, Clover Leaf district.

C. W. WHISLER, assistant general foreman of the Altoona (Pa.) car shops of the Pennsylvania, has become master mechanic of the Philadelphia terminal division.

E. O. SIEWEKE, assistant train master-assistant road foreman of engines, Cincinnati division of the Pennsylvania, with headquarters at Richmond, Ind., has retired.

C. T. HUNT, master mechanic of the Philadelphia terminal division of the Pennsylvania, has been transferred to the position of master mechanic, Philadelphia division.

GOMER D. JONES has been appointed to fill the newly created position of master mechanic of the Southern Kansas division of the Atchison, Topeka & Santa Fe, with headquarters at Chanute, Kan.

H. A. PATTERSON, assistant road foreman of engines, Cleveland division of the Pennsylvania, has been appointed assistant train master-assistant road foreman of engines, Cincinnati division, with headquarters at Richmond, Ind.

Car Department

S. M. EHRMAN has been appointed car lubrication inspector of the Chesapeake & Ohio, with headquarters at Russell, Ky.

A. B. WELCH, supervisor maintenance of equipment of the Texas & Pacific, with headquarters at Dallas, Tex., has been appointed car foreman of the Longview, Tex., shops.

Shop and Enginehouse

F. W. YOUNG, general foreman of the Dominion Atlantic Railway at Kentville, N. S., has retired.

J. D. MORRISON, locomotive foreman of the Canadian Pacific at Sherbrooke, Quebec, has been appointed general foreman of the Dominion Atlantic Railway, with headquarters at Kentville, N. S.

S. O. RENTSCHLER, general foreman of the locomotive department of the Missouri Pacific at Sedalia, Mo., has been appointed superintendent of shops, with headquarters at Sedalia, Mo.

SAMUEL CORNELL SNOW, machinist of the Louisville & Nashville at South Louisville, Ky., has been appointed night foreman of the Diesel road locomotive shop at

(Continued on next left-hand page)

OURS...and YOURS

WE INVITE you, Mr. and Mrs. America,
to share the honor of the Army-Navy Production Award
with the thousands of our loyal, skillful men
and women working on war orders in the office...
in the plant...and in the field.

SHARE IT with these workers...
you government officials who worked with them
closely, and with whole-hearted cooperation.

SHARE IT with them...you stockholders
who supported the early conversion of our plants
to war work, and approved our first efforts
to help our government.

SHARE IT with them...you men, women and children
who turned in sweat-stained bills...
checks that scraped the bottom of the bank account
...pennies from piggy-banks
...for Victory Bonds and Stamps.

ALL OF YOU gave your time, and effort, and money.

NOW, our government says that we spent well...
creating a tremendous volume
of the arms America urgently must have to win this war.

OUR HONOR is also your honor.
And this flag is also your flag.

UNDER IT, with your help, we intend to fight
the battle of production with still greater energy.

WE RATE it higher, and we'll fly it higher,
than any other flag in the U.S....

...except one.

AMERICAN LOCOMOTIVE

A NATIONAL ARSENAL OF MOBILE POWER

TANKS • GUN CARRIAGES • ARMY AND NAVY ORDNANCE • STEAM AND DIESEL LOCOMOTIVES

South Louisville. It was erroneously reported in the August issue that Mr. Snow had become foreman of the Diesel road locomotive shop.

ROBERT L. MORRIS, electrical-mechanical foreman of the Louisville & Nashville at Radnor, Tenn., has become foreman of the Diesel road locomotive shop at South Louisville, Ky. It was erroneously reported in the August issue that Mr. Morris had become night foreman of the Diesel road locomotive shop at South Louisville, Ky.

HOWARD CHARLES VINSANT, master mechanic of the Texas & Pacific at Marshall, Tex., who has been appointed shop superintendent at Ft. Worth, Tex., as noted in the July *Railway Mechanical Engineer,* was born on June 22, 1900, at Ft. Worth. After graduating from high school, Mr. Vinsant entered the service of the Texas & Pacific in August, 1917, as a machinist apprentice. On February 22, 1923, he became a machinist; on September 1, 1924, lead machinist; on April 1, 1928, assistant enginehouse foreman, and on June 22, 1929, enginehouse foreman at Mineola, Tex. He was transferred to the position of enginehouse foreman at Big Spring, Tex., on April 1, 1930, and on April 19, 1931, became general foreman of the Lancaster shops at Ft. Worth. He was appointed assistant master mechanic at the Lancaster shops on April 15, 1932; division general foreman, Rio Grande division, with headquarters at Big Spring, on December 17, 1933; master mechanic, Ft. Worth division, with headquarters at Ft. Worth, on May 29, 1934; master mechanic, Eastern division, with headquarters at Marshall, Tex., on August 1, 1940, and shop superintendent at Ft. Worth on June 1, 1942.

H. C. Vinsant

L. E. SCHUETTE, car foreman of the Mahoning division of the Erie, at Brier Hill, Ohio, who has been appointed shop superintendent at Susquehanna, Pa., as announced in the September issue, was born on April 19, 1898, at Kent, Ohio. Mr. Schuette was graduated from Kent high school in 1917 and on November 27, 1917, entered the service of the Erie as a car repairer at the Kent car shops. On December 1 of the same year he became piecework checker and on March 1, 1918, assistant foreman, steel yards, Kent car shops. He entered military service on November 20, 1918, and on September 15, 1919, returned to the Erie as car repairer. From November 1, 1922, to November 16, 1927, he was employed as an A. R. A. writer at Kent, at which time he became foreman of the upholstery department. On February 16, 1930, he was promoted to the position of assistant to the division car foreman at Marion, Ohio. On June 4, 1934, he became outside inspector for the Pullman Car and Manufacturing Company at Chicago. He returned to Marion, Ohio, on August 30, 1934, as assistant to division car foreman, and on October 1, 1934, became car foreman of the Ferrona car shops, at Sharon, Pa., and on October 1, 1940, division car foreman of the Mahoning division, with headquarters at Youngstown, Ohio.

L. E. Schuette

Purchasing and Stores

CLIFFORD THORBURN, assistant purchasing agent of the Southern Pacific, with headquarters at Portland, Ore., has been appointed purchasing agent at Portland.

M. C. NYSTROM, assistant purchasing agent of the Southern Pacific at San Francisco, Calif., has been appointed assistant general purchasing agent at San Francisco.

E. H. POLK, assistant purchasing agent of the Southern Pacific, with headquarters at Los Angeles, Calif., has been appointed purchasing agent at Los Angeles.

E. J. BECKER, assistant purchasing agent of the Southern Pacific, with headquarters at San Francisco, Calif., has become assistant general purchasing agent at San Francisco.

N. L. SATCHELL, storekeeper of the New York, Susquehanna & Western at Middletown, N. Y., has been appointed purchasing agent, with headquarters at Paterson, N. J.

C. E. WATSON, chief clerk in the general store department of the St. Louis Southwestern at Pine Bluff, Ark., has been promoted to the newly created position of assistant general storekeeper, with the same headquarters.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

CLEANING AND DESCALING MANUAL.—Oakite Products, Oakite Railway Service Division, Room 1001, Wrigley building, Chicago. A 24-page manual discussing Oakite Compound No. 32 for the removal of hard-water scales, rust and similar deposits from equipment, parts, and other metallic surfaces, including cooling systems of Diesel-electric locomotives.

◆

"MILLING MACHINE PRACTICE."—Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio. Revised edition. Booklet No. M-773-1; illustrated. Contains chapters on Analysis of the Process of Milling, Milling Cutters, Use of Milling Cutters, and Milling Machines, as well as additional information on the machining of magnesium and characteristic types of milling machines and attachments.

◆

WELDING EQUIPMENT FOR RAILROAD SERVICE.—Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Bulletin B-3050. Describes and illustrates welding equipment for all five types of railroad service—maintenance of way, shop maintenance, roundhouse maintenance, car building, and general repairs, maintenance and construction. Equipment includes Flexarc d.c. and a.c. welders, engine-driven welders, equipment for semi-automatic process welding, electrodes, and accessories.

◆

LATHES.—South Bend Lathe Works, Dept. Rs, South Bend, Ind. *Bulletin H-1, "Keep Your Lathe Clean."* Sixteen pages. The first of a series on How To Get the Most Out of Your Lathes. Shows how keeping lathes clean will help increase production, reduce scrap, and lengthen life of the lathe. Catalog 100B—*"South Bend Lathes";* 48 pages, illustrated. Contains sections on toolroom lathes, quick change gear lathes; plain change gear lathes; turret lathes, and attachments, features, and specifications.

◆

"SPECIAL STEELS—THEIR PROPERTIES AND USES."—Allegheny Ludlum Steel Corporation, Pittsburgh, Pa. Revised edition of Handbook of Special Steels. One hundred twenty-eight pages, spiral bound. Designed to be helpful in the selection of proper types of tool, stainless, electrical, and carbon steels in the various forms produced by Allegheny Ludlum. Contains also a table of recommended types for particular applications; drill rod information; a Special Products section on shoe die steel, silcrome valve steels, and special shapes; engineering tables, etc.

Railway Mechanical Engineer

November 1942

FOUNDED IN 1832

Published monthly by Simmons-Boardman Publishing Corporation, 1309 Noble Street, Philadelphia, Pa. Entered as second-class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, $3.00 for one year, U. S. and Canada. Single copies 35 cents. Vol. 116, No. 11.

RAILWAY MECHANICAL ENGINEER

Founded in 1832 as the American Rail-Road Journal

With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office.

NOVEMBER, 1942

Volume 116 — *No. 11*

Co-Ordinated Mechanical Associations' "Conventions in Print"

Published on the second day of each month by

Simmons-Boardman Publishing Corporation

1309 Noble street, Philadelphia, Pa. Editorial and Executive Offices: 30 Church street, New York, and 105 West Adams street, Chicago. Branch offices: Terminal Tower, Cleveland; 1081 National Press bldg., Washington, D. C.; 1038 Henry bldg., Seattle, Wash.; 300 Montgomery street, Room 805-806, San Francisco, Calif.; 530 W. Sixth street, Los Angeles, Calif.

Subscriptions (including, when published, the daily editions of the Railway Age, published in connection with the convention of the Association of American Railroads, Mechanical Division), payable in advance and postage free, United States, U. S. possessions and Canada: 1 year, $3; 2 years, $5. Foreign countries, not including daily editions of the Railway Age: 1 year, $4; 2 years, $7. Single copies, 35 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.), and is indexed by the Industrial Arts Index and also by the Engineering Index Service. Printed in U. S. A.

Why Conventions in Print?

Ordinarily it is not good practice to print the same item of information twice in the same issue but this time we're going to take a chance and call your attention to the fact that on September 1, 1942, history was made in the railroad industry. For, on that date, only 6.6 of the locomotives on American railroads were out of service and only 3.1 per cent of the freight cars were "bad order". In August freight locomotives made over 67 million miles and freight cars ran over three billion miles—more than the peaks of 1929. These accomplishments were made possible by American car and locomotive repair forces. They've been working for months to get equipment in shape to make history and they're all set to make some more. These are reasons why the meetings of the four mechanical associations—Car Department Officers', Railway Fuel and Traveling Engineers', Locomotive Maintenance Officers' and Boiler Makers'—were canceled this year. Upon one thing, however, all association members were agreed and that was that the technical knowledge and the interchange of ideas which association work makes possible were needed more than ever this year in the job of running the railroads. So, it was decided that the work of the many committees should go on, even if every member had to consider himself a part of a committee and contribute to the common fund of knowledge and recorded experience. Probably more people had a part in the preparation of committee reports for these associations this year than ever before and their work is done—well done. It is presented in the pages that follow and the secretaries of the associations will welcome your written comment on these reports so that it may be included in the annual proceedings when printed.

F. A. Longo,
Vice-President

Myron C. France, President

A. F. Stiglmeier,
Secretary-Treasurer

Master Boiler Makers' Association

Reports deal with problems of immediate interest to the members—Selection from ten papers on six subjects, prepared for the year book, presented here.

E. R. Battley,
Chief of Motive Power and Car Equipment, Canadian National

◆

D. S. Ellis,
Chief Mechanical Officer, Chesapeake & Ohio

B. M. Brown,
General Superintendent Motive Power, Southern Pacific

F. K. Mitchell,
Assistant General Superintendent Motive Power and Rolling Stock, N. Y. C.

◆

H. H. Urbach
Mechanical Assistant to Executive Vice-President, C., B. & Q.

Advisory Board Members

THE Master Boiler Makers' Association, in keeping with its long record of continuous constructive work in spite of adverse conditions, has carried through the preparation of an extensive program of committee reports which, because of the inability to hold a meeting this year, will be presented to its members in the usual book of "proceedings." These reports and papers, of which ten have been prepared, deal with the following six topics: Cinder cutting on locomotive boilers; applying and maintaining flues and arch tubes without copper ferrules; chemical treatment of boiler feedwater; a study of defects developing in high-pressure boilers; methods of fabrication of boilers, and material conservation and substitutions in the boiler shop. Abstracts of a selection of these papers are presented here. Other papers will be the subjects of articles in later issues.

Because no meeting of the association is being held this year, there will be no election of officers. The officers elected at the 1941 annual meeting will continue to serve. They are: President, Myron C. France, general boiler foreman, C. St. P., M. & O., St. Paul, Minn.; vice-president, Frank A. Longo, general boiler inspector, So. Pac., Red Wood City, Calif.; secretary-treasurer: A. F. Stiglmeier, general supervisor boilers and welding, N. Y. C., New York.

The members of the Executive Committee whose terms expire in 1944 are Sigurd Christopherson, supervisor of boiler inspection and maintenance, New York, New Haven & Hartford, East Milton, Mass.; R. W. Barrett, chief boiler inspector, Canadian National, Toronto, Ont.; E. H. Gilley, general boiler foreman, Grand Trunk Western, Battle Creek, Mich.

The Executive Board of the Association has adopted a ruling that members of the association in military service shall not be required to pay dues for the duration of the war.

President France's Address

Although we were considerably disheartened by the news that no annual meeting could be held this year, we realized that any feeling that we might have is of small consequence in view of the magnitude of the task at hand.

I can assure you, however, that it has been an unparalleled example of hard work on the part of the several committees, that has made these annual proceedings what they are. To them I owe my thanks for their cooperation. I was astonished by the response I received when I asked for volunteers to serve as committeemen for 1942. We got all we needed and more. Our Canadian brethren responded 100 per cent. I am extremely grateful for the active support given to the committee chairmen so that they could turn in for publication the fine material they have.

Our secretary-treasurer, "Al" Stiglemeier, needs no praise from me to show all of us what hard work, coupled with a natural-born aptitude for organization can do. His work in preparing the questionnaires and compiling the results is his gift to the railroads and to our friends, and we are proud to present the annual proceedings to them.

Also, our friends in the supplymen's association, our associates and officers of the other mechanical associations, the editors and officers of the *Railway Mechanical Engineer* are greatly missed, and it is our hope that we can all meet next year in the fellowship which has characterized our gatherings.

To those of you who have relatives and friends engaged in our armed forces we pray the Almighty for a speedy return home with the fruits of victory. I am sure that the members of our craft are 100 per cent behind them, and I feel sure that as individuals we are exceeding the 10 per cent quota in the purchase of War Bonds and Stamps.

The Prevention of Cinder Cutting in Locomotive Boilers

Individuals quoted on underlying principles — 1938 and 1940 reports deal with practical methods of amelioration

S. A. Fegan,
Chairman

While it is the intention of the Committee on the Prevention of Cinder Cutting in Locomotive Boilers to refrain from using old matter found in previous proceedings it seems imperative in order to abide by this principle that readers of this report refer to the thorough and useful information and sketches set forth in the 1938 and 1940 issues of proceedings which cover practically all the data and methods brought to light from questionnaires received this year, particularly the tonnage and speed at which cinder cutting is effective, the combustion and velocity of gases, and the sketches of remedial practices for dealing with the most general and pronounced points of cinder cutting.

The committee finds that there is practically no new information in the papers received concerning the construction and maintenance of boilers in relation to the elimination of cinder cutting.

Thirty-four questionnaires were received from various railroads, and of these 30 dealing with classes of power from the Mikado the 2-8-8-2 articulated type (all in heavy service) have been considered.

To sum up the comments received, cinder cutting is the result of necessary high firing rates to get maximum capacity out of the locomotive, and is influenced adversely by the use of coal with low heating value, the use of types of superheater units, grates, brick arches and front-end applications that materially obstruct the flow and increase the velocity of gases and unburned fuel.

It is questionable if there is any net savings by changing these appurtenances. Most tests to date have shown their fuel saving value, and some roads have been convinced that the damage from cinder cutting does not justify increasing the fuel bill, or reducing the locomotive capacity, and repairs of cinder cut portions are made at such periods as experience has demonstrated that failures may occur. So far this has proved to be the best method of control.

Our secretary has received a reply to a letter regarding cinder cutting from an authority on drafting, as follows:

The Combustion System

"The problem of combustion in a locomotive is made up of several components. I always like to consider the locomotive boiler as a system insofar as the burning of coal is concerned. This system, when put together, must burn the fuel efficiently and provide ample boiler capacity for the cylinders with the least use of energy from the exhaust steam (lowest possible pressure) and with a steaming margin for the poor fireman and poor grade of coal.

"There are certain limitations that have to be kept in mind. The ash-pan openings shall be such that no fire can escape. The diaphragm, table plate and spark arrester must be arranged to make the front end self cleaning and break up the cinders so they will be ejected from the stack as small harmless particles, these parts to be arranged and proportioned to offer the least resistance to the flow of gases.

"The stack shall be small enough to prevent smoke trailing and the exhaust nozzle of such size as to provide sufficient energy from the exhaust steam to eject and lift the gases of combustion at capacity and light operation.

Cinder Erosion Increases with Firing Rates

"The gas area through the tubes and flues is one part of the system that cannot be altered on present power and presents a problem on new power due to dimensional limitations. This brings us to the problem of cinder cutting. If we consider a locomotive of given gas area through the flues and change any part of the system, we can alter the drafts, but this does not appreciably affect the velocity of gases through the flues at any given firing rate. Gas velocities through the flues are almost entirely dependent upon the amount of coal that is fired and the area through the flues. For each pound of coal fired approximately 11 lb. of air are required. Roughly speaking, if 4,000 lb. of coal are burned per hr., we will have 12 times 4,000 or 48,000 lb. of gas per hr. If 12,000 lb. of coal are fired per hr., we will have 12 times 12,000 or 144,000 lb. of gas per hr. Regardless of the exhaust pressure or draft used to induce the flow of gas through the tubes, the velocity of the gas will depend solely upon the open area through the tubes. Since unburned fuel or cinder loss and gas velocities are proportional to firing rates, cinder erosion will naturally increase with the firing rates.

"In our present freight power using coal from a certain district we are losing up to about 35 per cent of the coal fired in unburned fuel. The greatest part of the unburned fuel is in the form of combustible cinders. If we can cut this unburned fuel loss in half, we will have increased the boiler efficiency considerably, and cinder cutting should no longer be the problem it is today.

"It was thought by the writer that we should cover the entire grate area, or as much of it as is practical, with a brick arch. Such an arrangement should provide radiant heat at high temperature to the entire fire bed. It should prevent a direct draft from the back grates as is now produced with the standard arch arrangement, providing a more equal distribution of the draft over the entire grate surface. It should provide considerably longer burning time for all small particles of fuel being carried in suspension since they would have to reverse their direction of travel at least once before passing to the tubes. The so-called back-head baffle was developed for that purpose.

Better Distribution of Combustion

"It is evident that we are firing too much coal to the center of the firebox with our present standard stoker jet and distributing plates on locomotives. The area along the side sheets in the front two-thirds of the firebox was being starved. Alterations of the stoker jet and distributing plates were made and provided much better fires and apparently bettered the combustion in the firebox. At the completion of the tests the fire held up along the side sheets; this should protect the sheets from cold air. The CO_2 was increased better than one per cent at all firing rates while the evaporation was increased approximately 2,000 lb. per hr. The superheat temperature dropped. From these conditions it is apparent that the heat release in the firebox was increased while the release in the flues was decreased indicating a reduction in unburned fuel being carried into the flues.

"A crown-sheet baffle would increase the burning time above the arch, and would tend to direct and distribute the gas and unburned fuel or cinders before entering the flues. I believe that records would show that the above mentioned locomotive has had less flue plugging and less cinder erosion of flues than other locomotives of this class operating in the same service. The most trouble experienced with this locomotive has probably been the slagging or honeycombing of the flues and the accumulation of slag in the bottom of the combustion chamber. A baffle of brick at the top of the crown sheet will produce honeycomb and slag.

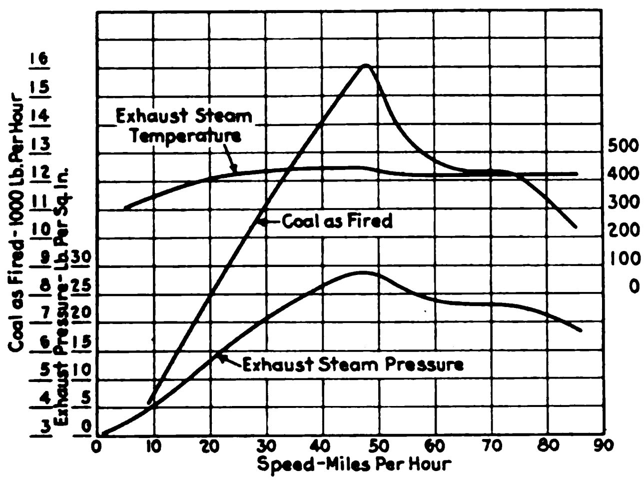
"Experience has shown that fine particles of coal up to ¼ in. in diameter will stick to the plastic surface of the arch brick and burn. They deposit their ash in a molten state on the brick, and since they are so numerous, the molten ash collects quite rapidly and is carried over the arch or off of a brick baffle in the form of small molten drops. These drops will solidify at a temperature of about 1,900 deg., consequently when they strike a comparatively cool surface such as a staybolt head, flue bead, or unit end they cling and cool. Other molten drops of slag constantly build up on the first drops which have wrapped themselves over the flue beads until eventually the flues become entirely coated over and the flue sheet plastered in a solid mass. This accounts for the fact that coals of high ash or slack content produce a great amount of honeycomb.

"The graph sheet illustrates the relation between exhaust-steam pressure, exhaust-steam temperature, coal fired per hour, and locomotive speed as determined during capacity tests. Note that the maximum firing rate or boiler capacity is reached at about 48 m.p.h. At speeds above or below 48 m.p.h. the firing rate is somewhat less. The highest firing rate obtained with full cut-off is about 7,000 lb. of coal per hr. This is less than half the firing rate of about 16,000 lb. per hr. at 48 m.p.h., or at boiler capacity. On one class of locomotive the boiler capacity is reached at about 58 m.p.h. because of the larger diameter of the driving wheels. The graph is based on the maximum drawbar pull at all speeds, and naturally the cut-off required to give the maximum drawbar pull. Part throttle or short cut-off operation would lower the firing rate at any speed.

"This boils down to the fact that cinder cutting is caused by cinders and that a decrease in cinder erosion can only be brought about by reducing their number or reducing their velocity. The reduction of velocity can be obtained by increasing flue areas in larger diameter boilers or through the use of different design of superheaters. This would be an attack of secondary nature, while the primary attack should be made on the production of the cinders themselves."

Open-Type Front Ends Reduces Firebox Erosion

One member of the committee who has made an extensive study of the subject writes in part: "Prior to 1932 we were having considerable cinder cutting in the firebox on flues and staybolts. The old type Master Mechanics' front end was then in use. The matter of an open-type front end was considered and in 1932 we started to equip our 2-8-2 and 2-8-0 locomotives with the Cyclone front end. All this class locomotives were used, and still are, in freight service. In my experience the open-type front end not only entirely eliminated right-of-way fires but also checked the cinder cutting in fireboxes, for at this time we have no firebox trouble from cinder cutting. This, I believe, is due to the fact that we have a less restricted type front end, thus, decreasing the velocity of the cinders in the firebox and increasing them in the smokebox.



Relation between exhaust-steam pressure, exhaust-steam temperature, coal fired per hour, and locomotive speed

"With this open-type front end we have a great deal of cutting in the smokebox, especially the smoke stack, lift pipe and some rivets in smokebox front door ring. For example, a smoke stack and lift pipe with the open type will last from 14 months to 2 years whereas with old type Master Mechanics' front end a smoke stack and lift pipe would last 8 to 10 years, and some locomotives never had the smoke stack renewed in 20 years. Thus, it has proved here that we have eliminated the cinder cutting from the firebox and taken it to the front end. It is a great deal more economical to replace smoke stacks and lift pipes than flues, sheets, and staybolts. We are getting four years on flues and side sheets, without any trouble from cinder cutting. Locomotive mileage averages 150,000 to 200,000 in this period of four years."

Effect of a Baffle Arch

Another member with recognized experience, dealing with three different types of front ends on the one railroad states in part: "We experience a peculiar condition of cinder cutting on the back flue sheet on one class of our heavy power, 2-8-2 and working pressure of 210 lb. These engines had 239 2¼-in. flues and 45 5½-in. superheater flues. This cinder cutting started at the top of the flue sheet and went down about 18 in. and about 48 in. wide. By removing one brick from the top of the arch we overcome 90 per cent of this cinder cutting. These engines all have Master Mechanics' front-end appliances.

"Our heavy 4-8-4 power, with a working pressure of 250 lb. per sq. in., had considerable cinder cutting on the crown bolts and on both sides of the syphon, about four rows down on each side. This condition was corrected by electric welding a small bar of steel ¼ in. diameter and 2 in. long, ½ in. back of each staybolt head in the cinder cutting area. This application requires about 460 bars of steel. The job was completed about one year ago and since that time I cannot recall of removing a crown bolt or a syphon bolt on account of cinder cutting, although we are renewing some of the bars.

"We have a similar condition on another class of heavy 4-8-2 power with a working pressure of 245 lb. per sq. in. The bars are also electric welded ½ in. back of each bolt head in the cinder-cutting area. A few of this class of power have a baffle brick between the two syphons at the crown sheet near the front of the syphon 12 in. deep. This brick stopped cinder cutting in the center of the crown sheet but had no effect on the right or left sides of the syphons. These engines are equipped with Kiesel front-end appliances."

An honorary member of the Association who contributed an article on this subject in the 1940 Proceedings, which principally dealt with the relation of the proper combustion of fuel to cinder cutting elimination, has contributed a paper in which he deals chiefly with draft control and its possibilities. The following is taken from this paper:

"We all know that cinder cutting is the indirect effect of the front-end draft. The maintenance of adequate boiler pressure is the primary consideration when drafting a locomotive. The detrimental results, such as cinder cutting, have been accepted as a necessary evil and therefore takes secondary place, but it would appear that sufficient draft could be obtained to complete combustion at varying rates without excessively high gas velocity.

"Tests conducted by the University of Illinois led to the conclusion that high draft peaks such as usually occur when a locomotive is started or operated slowly at maximum capacity, have no particular effect on cinder discharge. This theory, however, is to a certain extent contradicted in the moving pictures showing the behaviors of the fuel bed at various rates of combustion. These pictures support the theory that a continuous draft at lower gas velocities causes less disturbance to the fuel bed, and that draft is more a question of the volume of steam discharged from the exhaust nozzle in a given time than of the velocity of jet. If this point is considered tenable, then it would appear that the first steps toward the reduction of cinder cutting should be in the direction of a softer and more continuous draft.

Exhaust Volume Chamber Proposed

"This brings us back to experiments conducted for creating a constant draft by exhausting the steam from the cylinder into what was termed a volume chamber, and from which it passed through the nozzle. While that arrangement functioned, nevertheless there were certain features connected with it that prevented its general adoption, but the underlying principle was sound, and, in my

opinion, has sufficient merit to warrant reconsideration.

"In the majority of present-day locomotives the cylinders, valve chamber, cylinder saddle and frames are usually cast integral. One suggestion for taking advantage of the principles of the Lewis draft appliance would be to make the cylinder saddle a steam-tight chamber, eliminating all exhaust passages so that the steam from the cylinders could be exhausted directly into this chamber and pass from there through the exhaust nozzle.

"As the dimension of this chamber would be equal in capacity to about four cylinder volumes, the exhaust steam, following Boyles law, would be reexpanded in this chamber and its pressure reduced. This would mean a corresponding reduction in the cylinder back pressure and a corresponding increase in the mean effective pressure.

"By using the cylinder saddle as an expansion chamber the volume of steam to be discharged from the exhaust nozzle is not reduced, but as a result of its lower pressure the velocity is reduced. If the doubters still feel that velocity is necessary then, instead of one single-orifice nozzle tip, use four orifices the combined area of which would equal that of the single orifice tip, thus obtaining a higher gas velocity and at the same time an equivalent front-end vacuum with constant flow. This should be the first step and one that is entirely feasible in modern locomotives. The next step would be streamlining the inside of the front end so that all draft currents issuing from the tubes would take a natural flow to the stack instead of impinging against obstructions now placed in the front end for the sole purpose of reducing the size of the cinders.

Get Rid of Jet Action Through the Grates

"The next step would take us to the firebox where cinders originate. Tests too numerous to mention have been made under varying conditions all over the country. In every test it was found that the primary cause of cinder discharge was the lifting action of vertical air jets passing through the grates and the firebed. This would suggest that steps be taken toward reducing or limiting vertical air jets, or, where such expense is considered unwarranted, it would appear that some means could be developed to deliver top or supplementary air in such a way as to counteract the effect of vertical air jets. Even though such means did not entirely eliminate that effect it nevertheless should result in an increased gas turbulence which in turn would increase the efficiency of combustion, resulting in higher temperatures and possibly the complete combustion of the smaller particles of coal before they reach the tube sheet."

Most every master boiler maker is seeking for a device or construction to overcome the high draft velocity, and obtain a constant flow of draft through all sections of tubes and flues, realizing that if this could be accomplished cinder cutting would be overcome.

Until such time as some device is arrived at and generally accepted and adopted, we, as boiler men, are confined to the limit of areas and volume with the present day locomotive construction, and will have to resort to the methods of such prevention as have been mentioned in this and earlier papers to maintain the boiler under the ever increasing demand for greater service.

The committee regrets that all meetings have been cancelled, thereby rendering it impossible to have the customary valuable discussions on the subject.

The report was signed by S. A. Fegan (chairman), district boiler inspector, Canadian National, Toronto, Ont., Canada; H. A. Bell, general boiler inspector, Chicago, Burlington & Quincy, Lincoln, Neb.; R. P. Myers, boiler foreman, Lehigh & Hudson River, Warwick, N. Y.; W. Freischlag, boiler foreman, Wabash, Decatur, Ill.

A Study of Defects in High-Pressure Boilers

Survey of difficulties with respect to 939 boilers on 38 railroads—Ingenious method of seam patching described

E. H. Heidel, Chairman

High-pressure locomotive boilers operating in fast freight and passenger service have been found to be subject to defects not usually encountered with the older locomotive boilers operating at or near 200 lb. per sq. in. boiler pressure. Defects originating in longitudinal and circumferential seams of boiler shells and firebox sheets have been found in a considerable number of cases. Excessive maintenance of firebox sheets is reported by many railroads; side sheets, throat-sheet diaphragms, throat-sheet ears, syphon barrels and syphon heels requiring renewal after a comparatively short term of service.

The committee has assembled such information on this subject as it has been able to develop with the thought that a discussion of these boiler troubles will be of benefit.

A questionnaire sent out by the secretary resulted in a gratifying number of replies. The principal information developed through this questionnaire is presented briefly in Table I. The 939 boilers involved in the survey were divided as follows: Carbon steel 171, nickel steel 474, and silico-manganese steel 294. Five railroads operating 121 high-pressure boilers (i.e., 250 lb. per sq. in. or higher) with carbon-steel shells reported trouble, as did six railroads operating 368 boilers with nickel-steel shells, and three railroads operating 231 boilers with silico-manganese shells. No information was presented in regard to the number of individual cases of shell trouble, and it will be noted that above 265 lb. per sq. in., all boilers reported were of nickel or silico-manganese steel.

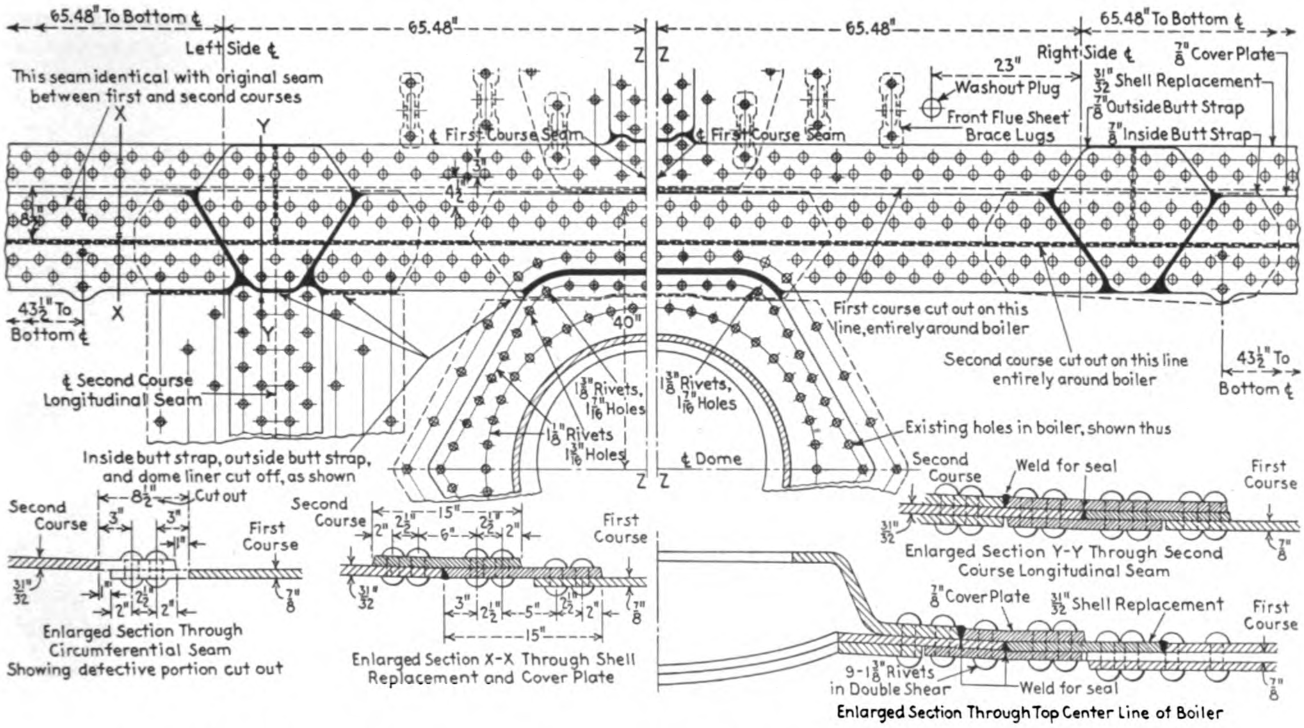


Fig. 1—A method of replacing a defective circumferen.ial seam between the first and second boiler courses

The committee does not wish to draw any conclusions from such a limited amount of data other than to point out that riveted-seam failures occur above 250 lb. per sq. in. boiler pressure in boilers of carbon steel, nickel steel and silico-manganese steel. Higher pressures and larger boilers mean greater expansion and contraction in the firing up and cooling down periods, and where two or three sheets are connected by rivets the time element must be considered when the boiler is heated up or cooled off to prevent excessive strains on rivets and sheets. This difficulty would not be encountered when single sheets are used, as would be the case with a welded boiler shell. It is suggested that locomotive boilers of the conventional design and size for pressures above 250 lb. per sq. in. are beyond the scope of riveted design.

Experience with defective seams in high-pressure boiler shells indicates that fine cracks develop in rivet holes, usually in the circumferential seams. In the early stages these cracks are discernible only with a magnifying glass after the rivet has been removed. These cracks, which appear to be both inter-crystalline and trans-crystalline, progress until the crack extends from rivet hole to calking edge, or to an adjacent rivet hole, or into the solid plate and leakage results, which in most cases is the first indication that a defect has developed. Investigation usually indicates the existence of a considerable number of defects in addition to those at which leakage is evident, other seams in the boiler being attacked. Seams have been observed where no cracking was evident from inside or outside of the boiler, but

Table I—Results of Questionnaire on Defects in High-Pressure Boilers

Railroad	No. of Locomotives at 250 lb. per sq. in. or higher	Maximum boiler pressure, lb.	Material of boiler-shell sheets	Has trouble been experienced	Nature of trouble
A	65	265	Nickel steel	No	....
B	50	300	Silico-manganese	Yes	Failure of riveted seams
C	25	300	Nickel steel	Yes	Cracking in third course over No. 2 cylinder saddle
D	None	210	Carbon steel	Yes	Cracks at front waist sheet
E	177	300	Nickel steel	Yes	Cracking in riveted seams
F	50	250	Carbon steel	No	....
G	37	310	Nickel steel	Yes	Rivets failing, and plate cracking in rivet segments
H	None	200	Carbon steel	No	....
I	66	260	Silico-manganese	Yes	Cracking in circumferential seams
J	None	200	Carbon steel	No	....
K	Not reported	250	Carbon steel	Yes	Flues, back tube sheets and side sheets give trouble
L	30	285	Nickel steel	No	....
M	None	220	Carbon steel	No	....
N	11	250	Nickel steel	No	....
O	Not reported	250	Carbon steel	Yes	Cracks at circumferential seams
P	20	285	Silico-manganese	No	....
Q	None	215	Carbon steel	No	....
R	75	250	Nickel steel	Yes	Cracks in circumferential seam, first and second course
S	None	245	Carbon steel	Yes	Staybolt leakage
T	31	275	Silico-manganese	No	....
U	51	265	Carbon steel	Yes	Cracks at throat sheet and end of waist sheet
V	10	260	Nickel steel	Yes	Cracks from boiler-check holes
W	None	210	Carbon steel	No	....
X	12	250	Silico-manganese	No	....
Y	Not reported	250	Carbon steel	No	....
Z	44	300	Nickel steel	Yes	Cracks at rivet holes in shell and wrapper sheet seams
AA	None	220	Carbon steel	No	....
BB	Not reported	250	Silico-manganese	No	....
CC	None	225	Carbon steel	No	....
DD	115	300	Silico-manganese	Yes	Cracks from rivet holes in shell courses
EE	None	220	Carbon steel	No	....
FF	None	240	Carbon steel	Yes	Cracking at circumferential seams
GG	65	250	Carbon steel	Yes	Cracks at outside throat sheet
HH	None	245	Carbon steel	Yes	Cracking at riveted joints
II	None	200	Carbon steel	No	....
JJ	None	200	Carbon steel	No	....
KK	5	250	Carbon steel	Yes	Cracking at throat sheet and wrapper sheet

when butt straps were removed and both butt straps and sheets Magnafluxed, the sheet faces which were together exhibited a large number of cracks radiating out from the rivet holes.

Shell Defects in High-Pressure Boilers

Table II, which follows, gives a record of the shell defects in high-pressure boilers occurring in a two-year period on one railroad operating 50 high-pressure locomotive boilers. All of these boilers were of silico-manganese steel, 40 operating at 285 lb. per sq. in. and 10 at 300 lb. per sq. in. These locomotives were built as follows: Two in 1935, one in 1936, 15 in 1937, 22 in 1938 and 10 in 1940.

A study of Table II, representing less than two years' experience with high-pressure boilers on this one railroad, would seem to indicate that the conventional design of riveted boiler is not satisfactory for the service expected of these locomotives. Another conclusion which has become increasingly evident is that the better the boiler work on a high-pressure boiler, the less likelihood there is that shell failure will occur. The necessity of eliminating leakage is also evident.

Repairing seam failures in large-diameter boiler shells of 1 in. or more in thickness presents a considerable problem. It is not unusual to find cracks from rivet holes in the second-course longitudinal seam, and at the same time in the circumferential seams at the front and back ends of this course, the cracks being found in first-, second- and third-course sheets. In a case of this kind it is not possible to reproduce the original construction exactly as the new course must extend ahead and back onto good material in the adjacent courses. Complications invariably occur where the new construction encounters existing longitudinal seams, waist-sheet reinforcements, and other stud and rivet holes. The difficulties encountered in replacing a defective circumferential seam between the first and second boiler courses is shown in Fig. 1. The importance of eliminating leakage as far as possible makes it necessary to use electric welding, and care must be constantly exercised to see that the boiler stresses are carried by the usual riveted construction. It is recognized, of course, that repairs of this kind are of a more or less temporary nature, but it is imperative that these modern locomotives be returned to service as quickly as possible, particularly in these times, and it might be pointed out that repairs of this nature have, in a number of cases, been in service now longer than the original construction.

Table II—Defects in High-Pressure Boilers

Locomotive	Date built	Type	Boiler pressure, lb.	Date of shell failure and mileage	Nature of defect
(a)....	Sept., 1938	4-6-4	300	Nov. 25, 1940—281,179	Circumferential seam, first and second courses, cut out and renewed, 110 in. long
(b)...	Feb., 1938	4-8-4	285	Jan. 17, 1941—285,959	Entire circumferential seam, first and second courses, cut out and renewed
(c)....	Nov., 1937	4-8-4	285	Feb. 21, 1941—281,065	Wrapper-sheet longitudinal seam, right side, cracked 40 in. long
(d)...	May, 1936	4-4-2	300	May 19, 1941—548,130	Longitudinal seam, second course, cracked 30 in. long
(e)....	Aug., 1938	4-6-4	300	June 10, 1941—370,762	Entire circumferential seams, first and second courses, and second and third courses, cut out and renewed
(f)....	Aug., 1938	4-6-4	300	June 14, 1941—375,732	Entire circumferential seams, first and second courses, and second and third courses, cut out and renewed
(g)...	April, 1938	4-8-4	285	July 3, 1941—314,640	Top half of second course, longitudinal seam and circumferential seam, first and second courses, renewed
(h)...	Sept., 1938	4-6-4	300	July 30, 1941—374,878	Circumferential seam, first and second courses, cut out and renewed 110 in. long
(i)....	Aug., 1938	4-6-4	300	Aug. 27, 1941—407,025	Circumferential seam, first and second courses, patched
(j)....	May, 1935	4-4-2	300	Oct. 22, 1941—766,746	Entire longitudinal seam, second course, cut out and renewed
(k)...	Sept., 1938	4-6-4	300	Nov. 8, 1941—422,816	Circumferential seam, first and second courses, cut out and renewed 220 in.
(l)....	Dec., 1937	4-8-4	285	Nov. 12, 1941—353,404	Entire second course, including circumferential seam, first and third courses, renewed
(a)*...	Sept., 1938	4-6-4	300	Nov. 24, 1941—422,906	Additional cracks in circumferential seam, first and second courses, patched
(m)...	April, 1937	4-4-2	300	Dec. 19, 1941—544,169	Top half of first course and circumferential seam, first and second courses, renewed
(n)...	Nov., 1937	4-8-4	285	Jan. 13, 1942—360,930	Wrapper-sheet longitudinal seam, right side, cracked 40 in. long
(d)*..	May, 1936	4-4-2	300	Feb. 14, 1942—654,000	Throat sheet cracked on right and left sides
(o)...	Dec., 1937	4-8-4	285	March 1, 1942—393,283	Wrapper-sheet connection seam cracked
(p)...	Jan., 1938	4-8-4	285	March 18, 1942—383,800	Wrapper-sheet connection seam cracked
(q)...	March, 1940	4-8-4	285	June 1, 1942—182,500	Longitudinal seam, third course, and circumferential seam, second and third courses, renewed
(i)*...	Aug., 1938	4-6-4	300	Aug. 7, 1942—536,300	Additional cracks in circumferential seam, first and second courses, patched
(k)*..	Sept., 1938	4-6-4	300	Sept. 1, 1942—537,200	Entire circumferential seam, second and third courses, cut out and renewed

*Second failure.

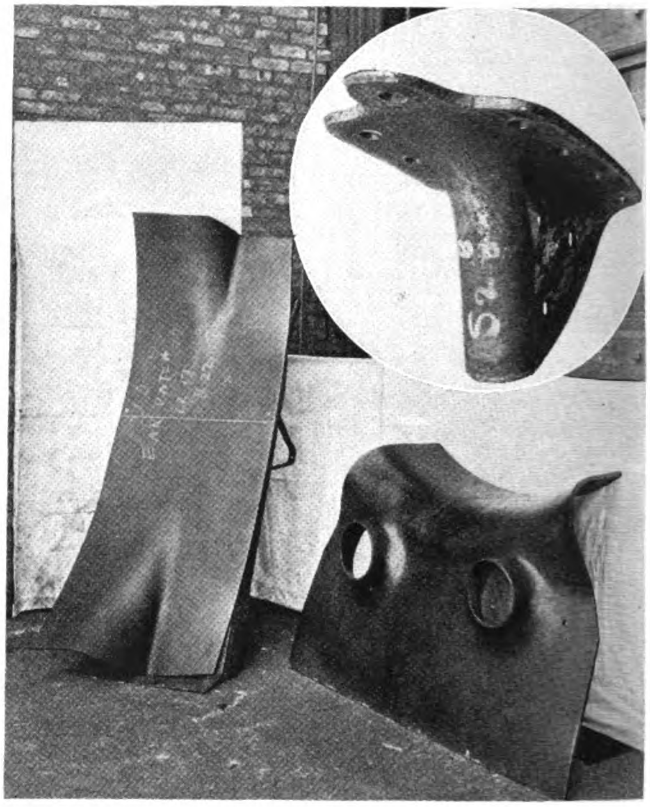


Fig. 2—Typical pressed-steel standard patches for boilers

Considerable difficulty has been experienced with firebox sheets in high-pressure, high-capacity boilers. One case was reported where new locomotives equipped with side boiler checks, feedwater heaters and syphons experienced leaking staybolts and blistered arch tubes during the first month the locomotives were in service. Investigation pointed to the possibility that feedwater from the heater was drawn back rapidly to the side-sheet water space by the high rate of circulation. The boiler check was relocated on top of the first boiler course, after which a very noticeable decrease in staybolt leakage was evident. As a consequence the boiler checks on

the remaining engines of this class were relocated on the top of the boiler. Side sheets on these engines were all renewed during the first six months of service, but there was no staybolt leakage after renewal of the sheets and relocation of the boiler checks, and six years' service was obtained from the new sheets.

The early and frequent renewal of throat sheet ears, diaphragm plates and syphon snub noses has led in some instances to standard patches being developed for these parts, these patches being made quickly and cheaply under the hydraulic press. Examples of these pressings are shown in Fig. 2. The use of molybdenum steel for firebox sheets is reported to have caused a marked increase in the life of the sheets.

Replies to the questionnaire indicated that a majority of the members favored a wide water space at the foundation ring, large radii at the corners, and that advantage should be taken of every means available to improve the circulation. It is also thought that too little attention has been given to the drafting of large locomotives, and that the arch design might be altered to permit a more uniform temperature throughout the firebox, so that the highest temperature will not be confined to that part of the firebox having the least amount of water on the fire sheets. It is felt that these large high-pressure boilers should not involve any unusual requirements in the fire box except to maintain terminal temperatures as near normal as possible. It is imperative that sufficient time be allowed at washout periods to permit normal expansion and contraction of the boilers when being cooled down or heated up.

In conclusion the committee feels that considerable thought and study must still be devoted to the design, construction, operation and maintenance of modern steam locomotives. The results to date seem to indicate that for pressures over 250 lb. per sq. in., the conventional riveted design is not satisfactory. As practically all shell defects originate in rivet holes of riveted seams, welded construction whereby the riveted seams would be eliminated should be given serious consideration. Better workmanship is required in building and maintaining high-pressure boilers than was necessary in the older 200 lb. boilers. Stress relieving of the shell sheets after rolling should be practiced for either riveted or welded construction.

The report was signed by E. H. Heidel (chairman), general boiler foreman, Chicago, Milwaukee, St. Paul & Pacific, Milwaukee, Wis.; F. A. Longo, general boiler inspector, Southern Pacific, San Francisco, Calif.; E. H. Gilley, assistant boiler foreman, Grand Trunk, Battle Creek, Mich.; L. R. Haase, master mechanic, Baltimore & Ohio Chicago Terminal, Chicago; E. E. Owens, general boiler inspector, Union Pacific, Omaha, Neb.; Frank Yochem, general boiler inspector, Missouri Pacific, St. Louis, Mo.; H. Mehling, boiler foreman, Duluth, Missabe & Iron Range, West Duluth, Minn., and O. H. Kobernick, general boiler inspector, New York, Chicago & St. Louis, Conneaut, Ohio.

Application and Maintenance of Flues and Tubes

A study of the methods used on a number of railroads, together with performance data

Sacchi

S. G. Longo, Chairman

Last year it was decided to make a further study of this subject. A questionnaire was therefore sent to boiler men in the United States, which was confined to present day locomotives.

We found a difference of opinion and, therefore, prepared our report to present the practice in effect on the majority of railroads. Some will not agree with our findings. There is a difference of opinion among practical men in the boiler field regarding the methods used in cleaning, safe-end welding and testing of flues and tubes preparatory to applying to the boiler.

The life of flues and tubes depends entirely on the type of locomotive and the service. On some the full four years' service is obtained with a possibility of an extra year extension. On others of the same type of locomotive, where the boiler water is not being treated, flues and tubes are required to be renewed in two and three years, because of improper water circulation on account of the accumulation of mud and scale causing pitting and also fire cracking.

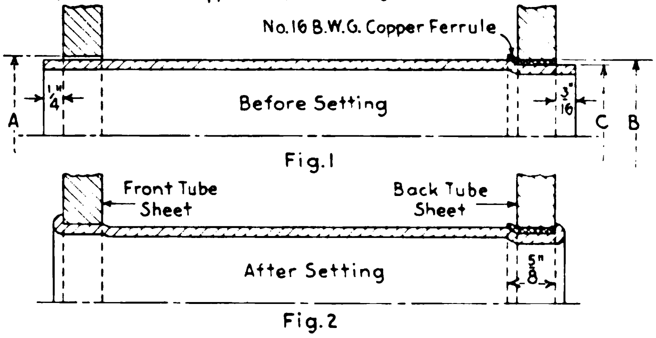
Before the flues and tubes are applied, all the holes in the tube sheets are to be reamed smooth and true. The burrs must be removed from the edge of the holes on both sides of the sheet and rounded off to $\frac{1}{16}$ in. radius. The tube sheets must be straight before the flues or tubes are applied. "Strong-backs" should be used if necessary to straighten the sheets. But, strong backs must be removed before the flues or tubes are applied. If the sheet will not remain straight it should be reheated and straightened to avoid unnecessary strain on the flues or tubes. The flues and tubes must be straight before being placed in the boiler, the ends cut off square and annealed, free from burrs. Also file or grind off all scale.

All the tube holes in the new back tube sheets are drilled 2 in. and $2\frac{1}{4}$ in. in diameter for 2-in. and $2\frac{1}{4}$-in. tubes, $3\frac{1}{32}$ in. in diameter for the swaged end of the $3\frac{1}{2}$-in. superheater flue, and $4\frac{17}{32}$ in. in diameter hole for the swaged end of the $5\frac{3}{8}$-in. and $5\frac{1}{2}$-in. superheater flue. The front tube sheet holes are drilled $\frac{1}{16}$ in. larger in diameter of the tube and flue.

The 2-in. and $2\frac{1}{4}$-in. tubes are heated hot and swaged. Most railroads prefer a straight swage and others a taper swage $\frac{1}{8}$ in. smaller in diameter, allowing for the application of the copper ferrules as shown in Fig. 1.

The 3½ in. diameter flues are swaged to 3 in. diameter, and the 5⅜ in. and 5½ in. diameter flues are swaged to 4½ in. diameter. Some railroads are applying the large flues as mentioned in the above, with copper ferrules in the back tube sheet and beading them while others are applying them without copper ferrules and electric welding them as shown in Fig. 4 with very good success.

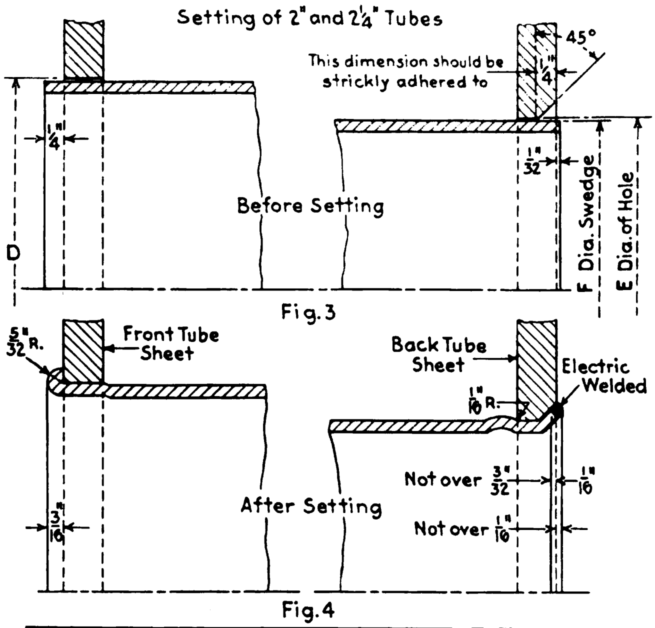
Note:-
Tube sheets must be straight before tubes are applied, and tubes must be straight before being placed in boiler. Holes in sheets to be carefully cleaned.
Ends of tubes must be cut off square free from burrs, also file or grind off all scale.
For the size, thickness, length and number of tubes and superheater flues applicable, see drawing entitled "Boiler Tubes"



Size of Tube	Front Tube Sheet	Back Tube Sheet	
	Dia. of Hole A	Dia. of Hole B	Dia. of Swedge C
2" Dia.	2 1/16"	2"	1 7/8"
2¼" Dia.	2 5/16"	2¼"	2⅛"

Note:-
All tubes rolled in front tube sheet of which 20% are to be beaded over.
All tubes to be set in back tube sheet with copper ferrules and beaded over. Ferrules to be rolled in hole before tube is inserted.

Setting of 2" and 2¼" Tubes



Size of Flue	Front Tube Sheet	Back Tube Sheet	
	Dia. of Hole D	Dia. of Hole E	Dia. of Swedge F
5⅜" Dia.	5 7/16"	4 17/32"	4½"
5½" Dia.	5 9/16"	4 17/32"	4½"
3½" Dia.	3 9/16"	3 1/32"	3"

Note:-
All flues to be rolled and beaded over in front tube sheet. In back tube sheet, flues to be so rolled, prossered and countersunk that flue will be set snugly without cutting into back surface of tube sheet. Flue must be examined for tightness before being welded which must be done by the electric process.

Setting of 3½", 5⅜" and 5½" Superheater Flues

Figs. 1-4—Various methods of applying tubes and flues with and without copper ferrules in the back tube sheet

Used on 1⅞" and 2⅛" Swedged Flues; 2" and 2¼" Straight Flues

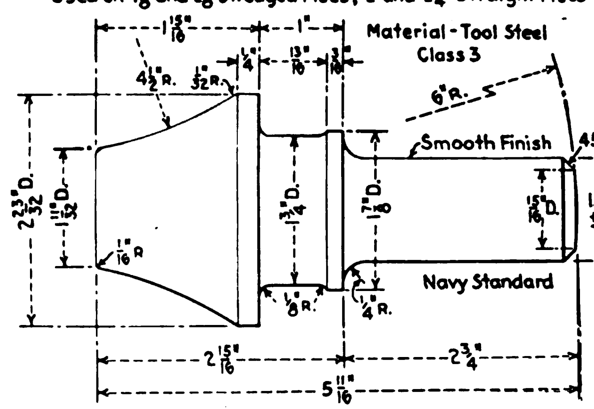


Fig. 5—Boiler-tube belling tool

The 2-in. and 2¼-in. tubes are applied with copper ferrules in the back tube sheet, as shown in Fig. 1, using 1/16 in. or .065 in. thickness of copper in the new back tube sheet. The copper ferrule is set back in the hole 1/32 in. from the fire side of the tube sheet, and lightly rolled in the hole by use of an air motor and self-feeding rolls, or with the use of blind expander to insure a snug fit for the entrance of the tube in the back tube sheet. The copper ferrules should be belled out on the water side of the back tube sheet by using a hand belling tool and hand hammer before the tubes are applied.

The boiler must be thoroughly clean. The tubes are then applied and set 3/16 in. long in the firebox for a bead either by lipping or pinning the end of the tube in the hole, care being taken not to batter the end of the tubes. They are then belled out by the use of a pneumatic belling tool, as shown in Fig. 5. When using the sectional expander (in Fig. 6) drive the pin in until it is fairly solid, then draw the pin out and give the expander a turn equal to half a section, then drive the pin in again. The expander should be turned at least three times during the operation, using a No. 60 or No. 90 air riveting hammer.

Expanding in Rolling Tubes

When expanding, or prossering tubes the center rows of tubes should be expanded first and working out on either side toward the outside rows of tubes, so as to create an equal expansion of the back tube sheet. The tubes should always be rolled and fastened in the front tube sheet before they are beaded in the back tube sheet.

All tubes are rolled tight in the front tube sheet by the use of an air motor and self-feeding rolls, of which 20 per cent are beaded to support and keep the tube sheet straight throughout.

The tubes are then beaded at the back tube sheet with what we call a No. 1 beading tool, as shown in Fig. 7. Fig. 1 shows the initial application of tubes in a new front and back tube sheet. Note that the copper ferrule is set back in the tube hole 1/32 in. from the fire side of the tube sheet, so it will not be exposed under the bead after the end of the tube has been beaded over.

After a locomotive in which the tubes have been reset has been fired up and tested out, and the firebox is cool enough to enter, all the tubes should be given a very light rolling and rebeaded, and cut off what fins may have developed, sand blasted and electric welded around the bead as shown in Fig. 8 using a ⅛-in. coated welding rod, straight polarity.

Most railroads prefer that the boiler be empty of water when welding tubes. In electric welding the tube beads the operator should start at the top center, lightly

at first, welding around to the bottom center and return, overlapping the weld at both the top and bottom center. The welding of tubes can be started at either side of the tube sheet by first starting on the top or bottom tube, welding each row vertically and continuing on across the entire back tube sheet, without warping the back tube sheet.

The application of flues as shown in Figs. 3 and 4 have been used with success on the Southern Pacific since

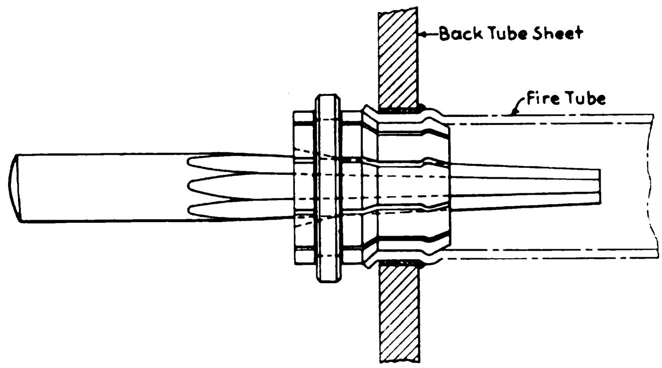


Fig. 6—The use of the sectional expander

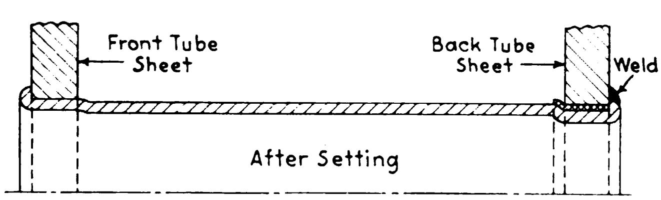


Fig. 8—Bead at the back tube sheet as welded after the locomotive has been fired up and tested

1926. Note that copper ferrules are not used in the back tube sheet in the application of superheater flues.

Application of Superheater Flues

All superheater flue holes in the back tube sheet are countersunk ¼ in. deep, or one-half the thickness of the back tube sheet and countersunk at a 45 deg. angle as shown in Fig. 3. This is done on a drill press after the flue holes have been drilled to size.

The superheater flues are set 1/32 in. long from the surface of the tube sheet on the fire side as shown in Fig. 3, the end of which is lipped over into countersink. The flue is then rolled tight in the back tube sheet by the use of air motor and self-feeding rolls and expanded three times. Follow the same procedure as when expanding tubes with a No. 60 or No. 90 air riveting hammer.

The flue is then set against the countersink by the use of a pneumatic fork tool, or a heavy fuller tool. Each flue is chipped on a 45 deg. angle opposite the angle of countersink in the back tube sheet as shown in Fig. 4, ⅛ in. deep from the face of the back tube sheet forming a perfect 90 deg. angle.

Any accumulation of oil or grit on the end of the flue, or in countersink of the back tube sheet, should be burned off by using an acetylene torch with a No. 12 welding tip, heating around the end of each flue where it is to be welded by making one circular pass taking each row vertically and starting at either side, care being taken not to overheat the back tube sheet.

The flue is electric welded to the back tube sheet with ⅛ in. or 5/32 in. coated welding rod, straight polarity. Starting at the top center, lightly at first, welding around to the bottom center, and return, overlapping the weld at both top and bottom centers, care being taken to prevent the weld from projecting too far out beyond the back tube sheet in the firebox. The welding of flues may be started at either side of the back tube sheet, welding each row vertically and continuing on across the entire back tube sheet, with the boiler empty.

In the front tube sheet flues are rolled with an air

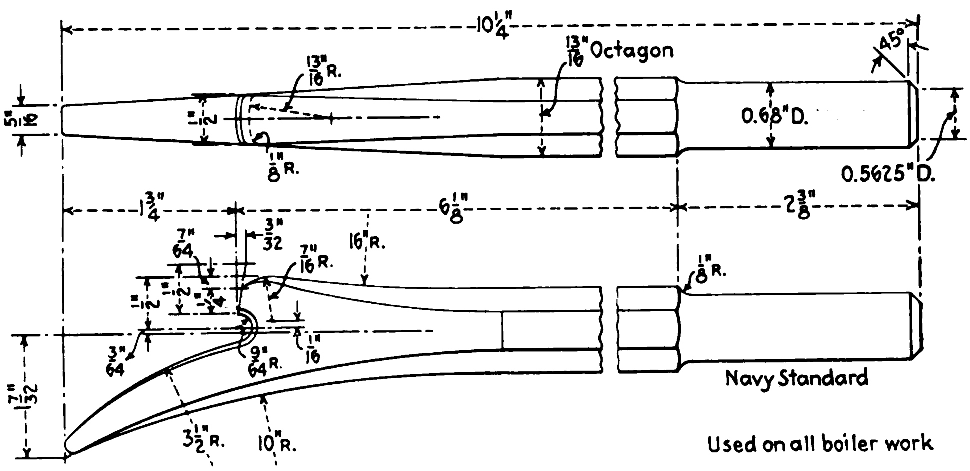


Fig. 7—No. 1 beading tool for fire tubes

motor and self-feeding rolls, belled out and beaded over with a No. 4 beading tool (Fig. 9).

When it becomes necessary to renew set of tubes and the tube holes in the back sheet have become enlarged to ⅛ in. over original diameter, a new back tube sheet should be applied.

In resetting the tubes or making repairs, tube holes in the back tube sheet should be reamed out to one true diameter, and burrs removed from the edge of the hole on both sides of the tube sheet. Copper ferrules of varying thicknesses (Fig. 10) are applied to compensate for the enlargement of the tube hole to suit the tube.

When the tube holes in the front tube sheet are found slightly enlarged, the tubes should be shimmed tight with black or jacket-iron shims of proper thicknesses (Fig. 11). The tubes should then be rolled in the front tube sheet with proper diameter self-feeding rolls, care being taken to prevent rolling too severely as this will thin out the tube walls and may result in a failure.

Leaky tubes should be tightened with sectional expanders and rebeaded with a beading tool. Care should be taken not to expand tubes too hard with expander, and not to touch the sheet with the beading tool. Excessive expanding destroys the tube and tube sheet. Constant use of the beading tool tends to wear out the

bead and grooves the tube sheet. Therefore, these tools should not be used unless necessary. When leaks develop in welded tubes or flues, the old weld should be chipped away, the tube reworked, sand-blasted, and rewelded.

Life of Boiler Sheets

We find that the average life of the back tube sheet in the combustion chamber type boiler, is about eight years, which usually requires a patch across the top knuckle of the back tube sheet during the first 12 to 18 months service. When horizontal cracks first develop in the top knuckle of the back tube sheet, due to the expansion and contraction, and the continual bending movement localized at this point, they are chipped out and electric welded with a single vee weld inside the firebox.

At the first shopping a narrow straight horizontal single vee, reinforced on the back butt welded patch taking in the top row of tubes, is applied and increased in size for each renewal of top knuckle back tube sheet patch when necessary.

After two years service many railroads renew the two bottom rows of tubes or flues at the bottom of the tube sheet on combustion-chamber type boilers because the long tubes and flues sagging at the center concentrate a stress at the front tube sheet resulting in grooving at the bottom side of the tube next to the front tube sheet on the water side. To overcome this sagging and grooving of the bottom row of tubes at the front tube sheet, a 1/16-in. by 2-in. by 4-in. black iron shim may be applied underneath the tube in the front tube sheet before rolling the tube. The shim is scarfed on the 2-in. ends and rolled lengthwise to fit the tube.

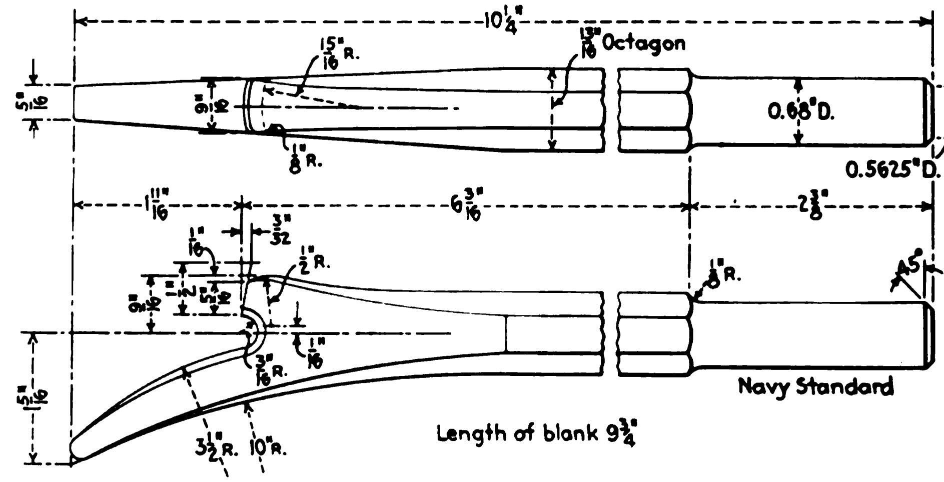


Fig. 9—Beading tool for use on superheater flues

Average Mileage Between Resetting of Flues-Southern Pacific

Type	Service	Miles per month	Mileage between resetting of flues
2-10-2	Freight	4,000 to 5,000	192,000 to 240,000
4-10-2	Freight	4,000 to 5,000	192,000 to 240,000
4-8-8-2	Frt. & Pass.	6,000 to 8,500	288,000 to 408,000
4-8-2	Passenger	8,000 to 10,000	384,000 to 480,000

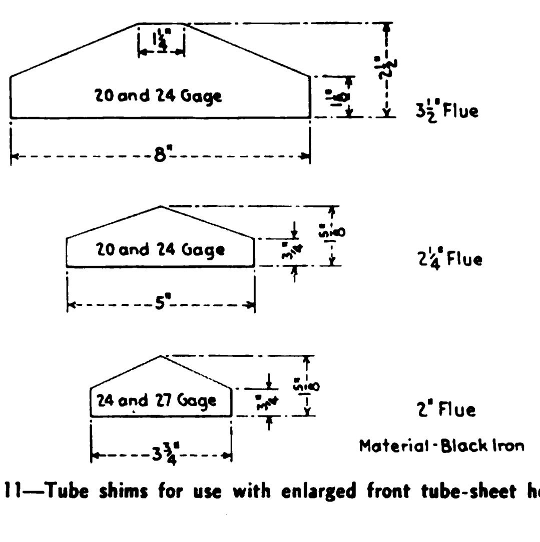


Fig. 11—Tube shims for use with enlarged front tube-sheet holes

Diameter of Flue	Inside Dia. of Ferrule	Thickness of Ferrule Dim. T	Length L
2" Swedged	1 7/8"	0.065"	5/8"
2" Swedged	1 7/8"	0.075"	5/8"
2" Swedged	1 7/8"	0.085"	5/8"
2" Swedged	1 7/8"	0.095"	5/8"
2 1/4" Swedged	2 1/8"	0.065"	5/8"
2 1/4" Swedged	2 1/8"	0.075"	5/8"
2 1/4" Swedged	2 1/8"	0.085"	5/8"
2 1/4" Swedged	2 1/8"	0.095"	5/8"

Taper in dia. 1/4" in 12"

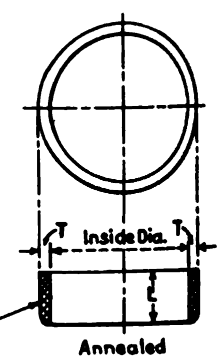


Fig. 10—Copper ferrules for 2-in. and 2¼-in. tubes

On smaller boilers tubes are renewed in the form of an inverted vee, making it easier to wash out the belly of the boiler.

The mileage a locomotive makes should be considered in estimating the life of tubes and flues. The elimination of pitting or grooving of tubes and flues is still a problem. However, the treatment of boiler water has reduced the tendency to pit.

The degree of clealiness and attention to maintenance is the principal factor in eliminating premature repairs.

The report was signed by S. G. Longo (chairman), assistant general boiler foreman, Southern Pacific, Los Angeles, Calif.; S. Christopherson (vice chairman), supervisor boiler inspection and maintenance, New York, New Haven & Hartford, E. Milton, Mass.; W. W. Funk, boiler foreman, Chesapeake & Ohio, Hinton, W. Va.; S. S. McConnell, general boiler foreman, Erie, Hornell, N. Y.; E. G. Staneiforth, general boiler foreman, Chicago, Burlington & Quincy, Denver, Colo.; J. M. Stoner, supervisor of boilers, New York Central, New York Central, Cleveland, Ohio, and C. E. Bodine, general boiler foreman, Missouri Pacific, Sedalia, Mo.

Substitution and Conservation of Materials

The committee offers thirteen specific suggestions for extending the life of critical materials, including new uses for scrap

E. H. Gilley,
Chairman

A majority of the materials involved in the fabrication and repair of locomotive boilers and tenders have been placed on the critical materials list by the War Production Board and as the demand for other materials increases a still further reduction may be expected in the amount and perhaps in the quality of the materials. We are at the present time limited as to the sizes of tank steel to be rolled by the mills. This will require the extensive use of welding in the building of new and repairing of old tenders and will materially increase the cost of repairs. It is quite possible that the size limit on plates will be extended to include flange and firebox steels.

Some of our railroads have utilized various alloy steels in locomotive boilers. These alloys are now available only for certain types of war materials and it will be necessary that those railroads make use of other materials for repairs. In addition to the substitution in material, the engineering departments will be called upon to devise means of using the materials available and making repairs to conform to the original factor of safety.

The utilization of the materials available on the railroad is largely a matter for each individual railroad to cope with. Some railroads may have a substantial quantity of materials on hand to enable them to carry through the emergency; others are not so fortunate. It would seem plausible and perhaps will be necessary for the railroads to exchange materials among themselves to enable all to operate to their fullest extent.

Supervisors will be called upon to exert their resourcefulness to the utmost, because when we save material we usually require additional labor either to make over or repair the parts involved in the saving. Personal inspection and consultation with all supervisors should determine if the period of service can be extended with safety or if it would be more economical to renew or repair the part involved. Where definite standards of repairs are established by maintenance regulations, it may be necessary to alter or amend the regulations during the period of the emergency.

Information compiled from the questionnaires indicates that, while no apparent shortage of materials is now being experienced, it is anticipated in the near future and provision is being made by all concerned to meet the emergency. The committee presents the following suggestions as worthy of consideration and trial by the Association members.

Specific Suggestions for Saving Critical Materials

Copper—The elimination of copper ferrels in flue and tube application will be covered in another topic. It is felt that the use of non-copper-bearing tank steel will increase tender pitting and corrosion and that tender interiors and coal spaces should be coated with some suitable material to retard this action. Copper gaskets for flexible-staybolt caps should be removed, annealed and reversed in the cap at definite periods. Copper gaskets for Huron washout plugs can be replaced with a composition of 93 per cent lead, 2 per cent zinc and 5 per cent antimony, this metal must be die cast and applied to the plugs in the same manner as the copper gaskets.

Rubber—The conservation of all rubber is necessary, keep all air and acetylene hose off the floor by providing suitable overhead hooks adjacent to work. Use shorter lengths of air hose by extending air connections and providing outlets at both ends of each pit. Do not renew any hose if suitable repairs can be made.

Flues and Tubes—Extend the period between flue and tube renewals by providing adequate water treatment. Reduce the number of lengths carried in stock. Increase the number of safe endings above that specified in maintenance regulations. Apply new tubes and flues only to the long boilers and cut down the old ones for the short boilers.

Air Reservoirs—Remove the heads and use air-reservoir bodies for smokestacks and drainage culverts and large size case-hardening cylinders. Repair old air reservoirs when possible to do so.

Welding Electrodes—Provide suitable storage receptacles for all sizes of electrodes. Take only the amount required to each individual job. Use to the shortest possible length and return stub ends to the manufacturer if suitable arrangements can be made.

Tank Steel—Save and mark sheared ends from all tank-steel plates and use for small liners, washers and small structural plates.

Firebox Steel—Save and mark sheared ends from all firebox-steel plates and use for patches, liners, small structural plates and tender repairs.

Flange Steel—Save and mark sheared ends from all flange-steel plates and use for patches and miscellaneous material for locomotives and cars.

Staybolts—Remove staybolts from all old firebox sheets, clean, normalize and use for making machine bolts or for making iron and steel billets for forgings.

Rivets—Old rivets may be utilized in making billets for forgings.

Firebox Sheets—Remove staybolts and use the old plate for tender splash plates, pit covers, air-duct covers, car-door plates, washers and small liners.

Barrel Courses—Apply half courses when possible. Removed courses and part courses should be straightened and used for patches, smokebox liners, boiler support sheets, reinforcing liners for air-pump brackets, hub liners, wheel-center counterbalance covers and boiler-check reinforcing plates.

Tender Plates—Plates removed in making tender repairs should be trimmed to sizes suitable for cab repairs, running boards, ash-pan sheets, and tender lap plates.

Material substitution and conversion will be more nec-

essary in the future. The committee suggests that as the members make these substitutions and conversions they advise the secretary of the results obtained so that their experience may be passed on to all members.

The report was signed by E. H. Gilley (chairman), assistant boiler foreman, Grand Trunk Western, Battle Creek, Mich.; W. N. Moore (vice chairman), general boiler foreman, Pere Marquette, Grand Rapids, Mich.; R. M. Cincoski, boiler foreman, Northern Pacific, St. Paul, Minn.; E. Giles, boiler foreman, Temiskaming & Northern Ontario, North Bay, Ont., Canada; D. P. Smith, general boiler inspector, Chicago, Burlington & Quincy, Burlington, Iowa, and E. J. Brennan, general boiler foreman, Boston & Maine, West Medford, Mass.

Treating Boiler Feedwater Chemically

A general survey of the various phases of water-treatment programs—Methods of treatment briefly described for the layman

By F. B. Horstmann,

Technical Director, Railroad Department, Dearborn Chemical Company

F. B. Horstmann

There was a time when the various phases of a boiler-water treatment program were handled by separate departments on the railroads and with no close cooperation between the departments—the water treatment by the test or chemical department, the water itself by the water-supply department of the civil engineering department, the operating and maintenance of locomotives by the mechanical department. In later years the chemist, whether in the water-supply department or in the test department, cooperates with the mechanical and engineering departments and others that have to do with train movements and locomotive operation. In this cooperation, careful studies have been made, resulting in complete scientific water-treatment programs.

Complete Softening

There are two methods generally followed in the complete softening of water, one the so-called lime-soda ash method and one the Zeolite method. Both methods require an elaborate layout of equipment and considerable space and considerable handling by plant operators and are, therefore, high in original cost as well as in operating expense.

The lime-soda ash method is one in which a sufficient amount of lime is used to combine with the bicarbonate and carbonate hardness in the water and a sufficient amount of soda ash used to combine with the non-carbonate hardness in the water. To these reagents other chemicals are often added to handle specific problems in certain types of waters. The chemicals are generally accurately proportioned to the water being treated, the water allowed to settle for a reasonable length of time, after which the clear liquid is ready for use as the water supply, the residual sludge being properly disposed of.

This type of treatment, if carried to the extent that an extremely low-hardness water is supplied for boiler purposes, has many disadvantages, first among which is the relatively high causticity that is initially supplied and which develops in working boilers. The relatively large amount of alkali salts present in the concentrated softened water, in combination with small amounts of precipitating solids, give considerable trouble in the way of foaming and priming. Lime-soda softening plants controlled closely so as to supply water most desirable for locomotive boiler use will experience trouble with scaled or incrusted water supply lines and water columns. Therefore, it is generally necessary in connection with lime-soda softened water to use an after-treatment to control foaming and to prevent incrustation in pipe lines, etc. An organic-inorganic combination treatment will generally perform this double duty.

The Zeolite method of water softening is one in which the water percolates or passes through a type of filter consisting of a bed of either natural or synthetic sodium Zeolite. In so doing, all of the calcium and magnesium, or hardness salts, are retained in the filter and exchanged for sodium salts which pass out of the filter in the water. The reagent used in this type of softening plant is common salt. A considerable amount of salt is required for each regeneration of the Zeolite filter. The regeneration process is as follows:

After absorbing its maximum amount of calcium and magnesium, it must have applied to it a concentrated solution of common salt so as to free its calcium and magnesium and thus be again converted to sodium Zeolite. The remaining unused common salt must then be washed out by means of a back-washing process requiring a considerable amount of wash water.

With this type of softening system there is no reduction in the total dissolved solid content of the water after treatment; in fact, there is ofttimes an increase to the extent of about five per cent with the total dissolved solids in the softened water being chiefly sodium salts. Without after treatment this water will give considerable trouble in the way of foaming and priming as well as corrosion and pitting, with considerable corrosion and pitting even taking place in the treated-water distribution and storage system. Therefore, it is necessary in practically all instances to use an after treatment consisting of an organic-inorganic combination.

Internal Treatment

Internal treatment is often referred to as partial treatment as against softening or complete treatment. This is because reagents generally are used only in sufficient amount to eliminate from the raw water the non-carbonate hardness and to provide the necessary amount of reserve treatment to assure a satisfactory boiler water. The amount and type of reserve treatment required depends upon several features of the raw water, the chief of which is the amount of non-carbonate hardness, the non-incrustants, the type and amount of dissolved gases, the character of organic matter, and the type and amount of suspended matter.

This method with mechanical applications of chemical requires simple proportioning equipment designed to handle the requirements of the water. The equipment should be accurate in its performance, but it need not be elaborate, does not require great amounts of floor space, needs very little attention, both as to maintenance or operation, and, therefore, has in addition to a low initial cost a low operating and maintenance cost. Frequently, if conditions permit, this type of treatment can be applied direct to locomotive boilers or tenders and, therefore, without any treating-plant equipment whatever, eliminating treating-plant initial operating and maintenance costs completely. The amount of reagents or chemicals required are considerably less in quantity than required for complete treatment and, therefore, easier and less costly to handle.

The principal reason for classing this type of treatment as "internal treatment" is that reactions are controlled to such an extent they are only partially completed externally but are for the most part completed internally in the working boiler.

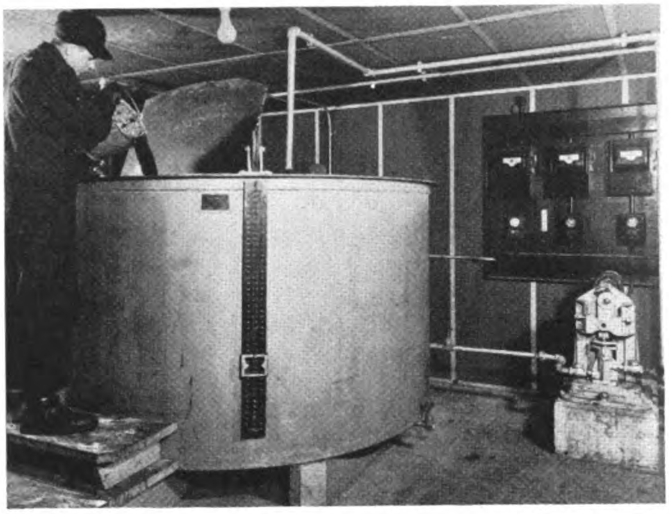
When internal treatment is referred to the general thought is of a type of treatment that reacts as a preventive of scale and incrustation and one that controls pitting and corrosion with no classing of anti-foam as an internal treatment. Anti-foam treatment should definitely be classed as an internal treatment as the reactions of this type of treatment, both chemical and physical, occur internally.

The above is a very sketchy outline of the various methods of water treatment generally in use today. Regardless of the method of treatment being followed, close observation has assisted in developing certain standards that are required in boiler water of working locomotives to assure continuous, efficient operation of locomotives at a minimum maintenance cost. In order to maintain these standards, it is the chemist's or water tester's duty to make the necessary continuous field tests on water as being supplied to locomotives and to order or make adjustments to keep it up to a satisfactory standard to assure the best type of locomotive boiler water. It is also the chemist's duty, or those working jointly with the chemist, to make observations on concentrated water from locomotive boilers to determine whether or not it is up to the standard required for a satisfactory concentrated locomotive boiler water.

In the constant removal of steam or distilled water from the working boiler the dissolved solids and suspended matter which are being constantly added in the feed water remain in the boiler. Certain of these solids remain in solution and others, due to chemical reactions brought about by internal reactions and heat, form sludge or suspended matter. Without treatment considerable of this sludge or suspended matter would form scale and incrustation and the concentrated soluble solids in conjunction with suspended sludge would increase the foaming tendencies of the water and the concentrated soluble solids in conjunction with dissolved gases and organic matter will stimulate corrosion and pitting.

The continuous increase of soluble solids, as well as precipitated sludge, requires provisions made for their proper removal. Blowing the locomotive is done for two specific reasons: one, to remove a certain proportion of the concentrated soluble solids, and, the other, to remove suspended matter or sludge or a combination of the two. To reduce or remove TDS (total dissolved solids) in a boiler in the most satisfactory and efficient manner, it is necessary that the blow-off facilities be properly arranged and, if possible, that blowing be done at such times as when no water is entering the boiler. To remove suspended solids from a locomotive boiler it is advisable that blow-off facilities or equipment be so arranged or placed on the locomotive that blowing will occur chiefly from the area in which the greatest amount of sludge or suspended matter accumulates. Since it has been found practical to eliminate water changes and to operate for extended periods of time between boiler washouts, it was found advisable to develop automatic blowing facilities or to follow systematic blowing schedules.

One of the widely used automatic blowing devices is the Signal Foam-Meter Electromatic blow-off system in which, through certain simple mechanical and electrical devices, enginemen are notified that the water, or the foam in the boiler, has arrived at a certain level. At a predetermined time blowing is automatically performed and is continued until such time as the water drops below a predetermined level. Should water or foam at any time rise to an extremely high degree, a further notice is given to enginemen and they accordingly can proceed to relieve the locomotive boiler by the regular method of hand blowing or by following any other procedure that practice recommends to control this foaming.



An automatic proportioning plant for wayside feeding of internal treatment

A further improvement has been made in this device in the way of the Electromatic foam collapsing blow-off system. With this particular device a locomotive is equipped with a closed end trough located longitudinally directly under the dry-pipe intake with the bottom below and the top above the normal water line. This trough operates as a skimmer and collects surface froth or foam at the point in the vicinity of the dry pipe and where it is most objectionable. This froth or foam rolls over into the trough and is collapsed into the form of solid water. When it arrives at a certain height in the trough, features automatically occur that provide for the removal of the collapsed foam.

Locomotives thus equipped are also provided with signal devices that notify the crew of the high-water or foam condition so that they are in the position to offer any additional relief in the form of hand blowing, if necessary. With either of these devices and with properly treated water it is generally unnecessary to set a specific boiler-water concentration for any particular locomotive or locomotive district.

Hand Blowing

For the hand-blowing method of concentration control it is necessary to determine the most satisfactory locomotive boiler concentration that can be carried on the particular class of locomotive, or locomotive district. After this a blowing schedule can be arranged that will specify a certain number of seconds to be blown over a specified number of miles or for a specified time of operation of the locomotive. As an example, on certain railroads passenger and freight locomotives are given 3-sec. intermittent blows from both the right- and left-hand blow-off cocks every 25 miles of operation. Some railroads have blowing posts located along the right-of-way and crews are given instructions of the amount to blow at blowing posts. Switch locomotive crews are given instructions to blow a specified number of times or seconds every half hour of locomotive operation.

Terminal Blowing

Railroads that are giving careful consideration to concentration control blow a scheduled amount when locomotives arrive at terminals and also blow a scheduled amount when locomotives are ready for despatchment. The amount blown on arrival at the terminal depends upon the boiler-water concentration on arrival and the concentration to which the boiler should be held at the terminal. Locomotives should be despatched at scheduled concentrations and, if the boiler water exceeds the specified concentration, boilers should be blown accordingly. Locomotives held under steam in enginehouses or in standby service should also have their boilers blown according to a schedule set to the time under steam so that a satisfactory working concentration will be had on despatch.

Satisfactory results from a complete water-treatment program can be obtained only with adequate control. Proper control in connection with the specific problem of blowing requirements is by the determination and regulation of boiler-water concentrations. This control should cover two important phases of boiler-water handling; namely, terminal and road.

Terminal Control

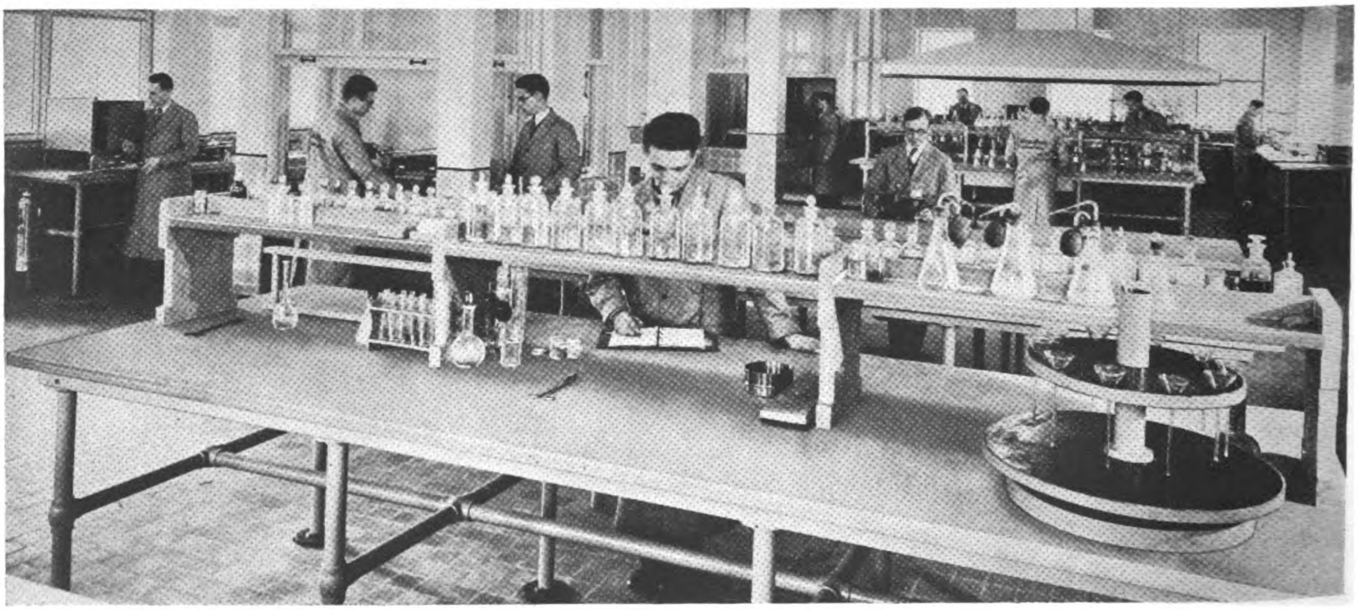
Samples of water should be properly collected from boilers upon their arrival at the terminal and at any other necessary time while at the terminal. These samples should be tested for total dissolved solids as well as any other tests that are generally considered necessary at the individual terminal at the time of sampling.

Road Control

A check on road or working performance of boilers should be made whenever thought necessary to determine the concentration pick-up and also to determine the amount of blowing that is being done or should be done. Samples of boiler water should be collected from working locomotives and tested for total dissolved solids. On these samples other tests can be conducted to determine if the boiler water is such as to assure satisfactory boilers and good locomotive performance.

Total dissolved solids is of particular interest in both terminal and road control. There are several methods for making their determination. Determinations of total dissolved solids by any of the approved field methods is remarkably exact when the amount of soluble solids present in the average concentrated boiler water is considered. Accordingly, great care and cleanliness is required in making the field determinations, equally as much as in the chemical laboratory where the chemist has access to very delicate apparatus and to ideal working conditions.

Considerable of the precipitated solids in a working boiler circulate with the water; therefore, any blowing performed removes a certain proportion of these insoluble solids along with the soluble matter. Any precipitated matter heavier than that which circulates, accumulates or gathers in quieter spots in the working boiler. At these spots or in these areas proper facilities should be provided for the periodic manual removal of these heavier precipitates or sludge. Circulating sludge and concentrated soluble solids can readily be removed by many of the



A modern chemical laboratory for making complete boiler water analyses

automatic blowing devices, such as the automatic constant blow-off system, Signal Foam Meter Electromatic blow-off system, or Electromatic foam-collapsing blow-off system. For the removal of the heavier non-circulating sludge systematic hand blowing should be practiced.

Meeting the qualification above noted, and generally

Field water testing laboratory at a railroad terminal

accepted, flues and sheets should be free from all indications of scale and incrustation and corrosion and pitting, and flues should be allowed extensions to the maximum. Staybolt breakage should be entirely eliminated. There should be no scale accumulation on bolts or fillets or scale formed where bolts and sheets join. Therefore, no overheating should be experienced. The boiler water should be sufficiently solid to give the necessary contact with bolts and sheets to give maximum heat transfer and, accordingly, prevent overheating from the lack of proper circulation.

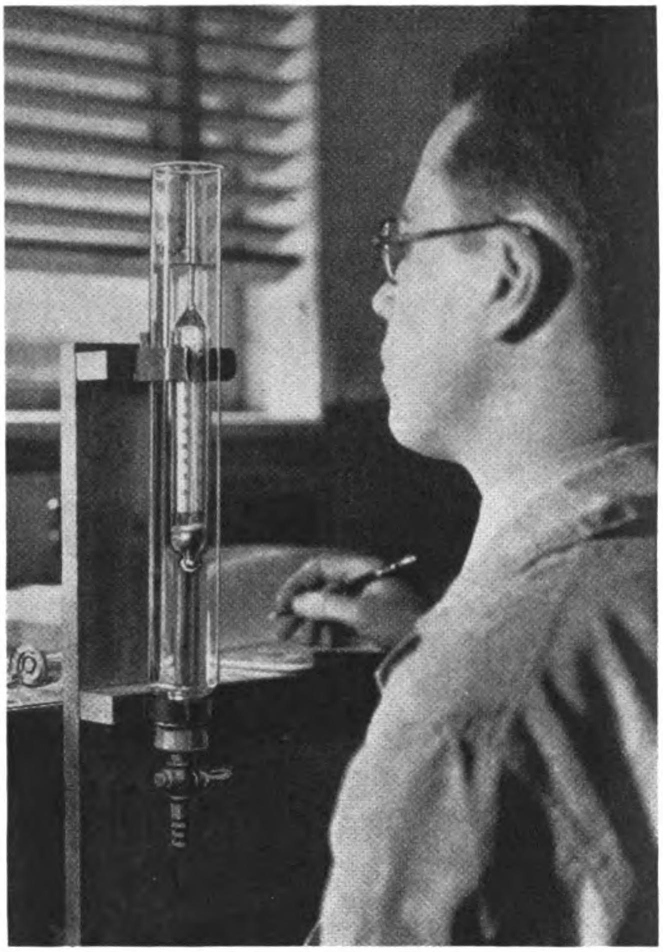
It has been argued that blowing of boilers results in a heat loss. This is true, but should the heat loss from improper circulation, insulating scale, etc., be checked against that required to keep a boiler always in best condition, it will be found that systematic blowing and proper water treatment are in the end considerably less expensive.

Under a complete scientific water-treatment program, shoppings are extended to several hundred thousand miles, locomotives work up to the legal limit between washouts, water changes are a thing of the past, and, accordingly, locomotives give practically a straight-line performance with the only time out being required for the between-trip layover and for the regular authorized inspections.

Thus far concentration control has been given chief consideration with but slight mention made of decrease in blow-off requirements. Blow-off, to a limited degree, can be controlled by the use of the various devices and methods heretofore outlined, but the most satisfactory procedure to follow to reduce the blow-off requirement is by the use of special types of water treatment that react in such a manner that steam bubble formation is brought under control.

Instead of endeavoring, as in the past, to overcome the ill effects of foaming by foam control, the scientific procedure to follow is to treat the locomotive boiler water in such a manner that steam bubbles developed in the body or on the surface of the boiler water have a surrounding film of a type that is practically no thickness and have a minimum of tenacity and, accordingly, break immediately on arrival at the liquid surface and without projecting any appreciable mist or droplets into the steam space. Thickness and tenacity of film are related and the procedure followed for controlling one will generally control the other.

By properly controlling the steam bubble film, boiler-water concentrations can be appreciably increased and



Determination of total dissolved solids by the hydrometer

blowing reduced in proportion to the increase in concentration. Better and more economical locomotive performance is possible with this type of foam control, the boiler water can carry the necessary water treatment that will assure complete freedom from scale and incrustation in the boiler as well as in boiler accessories and which will also completely neutralize all-corrosion possibilities.

Satisfactory complete treatment that will prevent all the troubles that have been heretofore experienced in locomotive boiler practice is possible. Such treatment is in practice on several railroads throughout the United States. Particularly during the present emergency when all railroad equipment should be performing at full time and most efficiently, it is important that all methods that bring about improved service should be adopted.

G. R. Andersen,
First Vice-President

A. J. Krueger,
Acting President

D. J. Sheehan,
Second Vice-President

Constructive Reports on Car Subjects Prepared

Car Department Officers' Association continues to function during the year but on reduced scale — War-time training of supervision and recommendations for revisions of interchange and loading rules among subjects discussed in five committee reports

I. M. Peters,
Third Vice-President

F. L. Kartheiser,
Secretary-Treasurer

P. J. Hogan,
Fourth Vice-President

THE national group of railway car supervisors, known as the Car Department Officers' Association, has held no general meeting since its annual convention at Chicago in September, 1941, but the general committee and various standing committees have met as required to keep the association functioning and make plans for the future. During the year, President F. E. Cheshire left his position as assistant superintendent car department, Missouri Pacific, to head up car matters for the Military Railway Service with the commission of Major, U. S. A. In the absence of Major Cheshire, A. J. Krueger, superintendent car department, Nickel Plate, who is a past president of the association, has assumed the duties of president.

Other officers of the association, promoted during the last year, include Vice-president G. R. Andersen, who has been made assistant superintendent of the car department, Chicago & North Western, and Secretary-treasurer F. L. Kartheiser, who has been made assistant to the executive vice-president, Chicago, Burlington & Quincy. All officers of the association will hold over until the next annual meeting.

In addition to President Krueger, First Vice-President Andersen, and Secretary-Treasurer Kartheiser, they are: second vice-president, D. J. Sheehan, superintendent motive power, C. & E. I., Danville, Ill.; third vice-president, I. M. Peters, superintendent and secretary, Crystal Car Line, Chicago; fourth vice-president, P. J. Hogan, supervisor car inspection and maintenance, N. Y., N. H. & H., New Haven, Conn.

Changes in Loading Rules Recommended

The reasons given include simplifications, increased security, and increases in scope of some of the rules

E. N. Myers,
Chairman

Because of the present emergency, the committee did not hold a meeting this year, but the chairman, with F. Cebulla, general car foreman freight equipment, Great Northern, the only other member located in the Twin Cities, went over these suggestions, presented by mail by the members. The committee submits the following proposed additions and changes in A. A. R. loading rules with the recommendation that they be referred to the Association of American Railroads for consideration by the Loading Rules Committee.

General Rule 4

Sec. B, Par. 2, reads as follows: The percentages of stenciled load-weight limits, as shown in the table, must not be exceeded for loads located between truck centers measured lengthwise of car, except when the car owner designates otherwise by note in the Official Railway Equipment Register, or by stenciling on the car:

Flat and Drop-End Gondola Cars	Other than fish-belly type sills, per cent	Fish-belly type per cent
18 ft. long or less	66.6	75
Fixed-end gondola cars		
10 ft. long or less	...	40
Over 10 ft. to 20 ft.	...	50
Over 20 ft. to 24 ft.	...	60
Over 24 ft. to truck centers	...	75
Extending beyond truck centers	...	100

The committee recommends that the last paragraph, "Fixed end gondola cars, etc.," be eliminated and this class of cars be included in "Flat and drop-end gondola cars."

Reason.—The construction of the underframe on fixed-end gondola cars is similar to flat and drop-end gondola cars.

Fig. 3 or Rule 21

The committee recommends that the following be inserted under Fig. 3 or in General Rule 21, or both: Cars must be jacked apart so as to fully compress draft gear by placing a jack on each side of coupler. Insert metal or composite blocks (except cast iron) to fully fill space back of coupler horn.

Reason.—Shippers comply with present rule requirements by filling space without jacking cars apart, leaving considerable space not filled in when draft gear and coupler slack is taken up in handling.

Fig. 5-A

This sketch of the method for narrowing loads of poles and lumber shows the wiring for the binder stakes, but no top wiring is shown for the other stakes. It is felt that this should be shown on the figure.

Fig. 6

The committee recommends that the A. A. R. Committee on Loading Rules give consideration to the advisability of removing Item E from Fig. 6. If the committee decides this should not be done, it is then recommended that the dimensions of Item E be 4 in. by 6 in., making the base 2 in. wider than the height.

Reason.—Experience has developed that these 4-in. by 4-in. pieces are acting as rollers which are an aid to disarrangement of loads. The loads shift off the blocks and it is impossible to get them back without reloading the material.

Fig. 40

The committee recommends that assorted widths or shapes 12 ft. or longer, loaded on flat cars, if lapped in one pile not extending over the side of the car floor, Item B be applied in all stake pockets and Items C and D not to be more than 3 ft. away from the end of the load. Plates less than 12 ft. long, side protection of 2-in. planks be securely nailed to Item B extending to the height of the load, Items C and D not to be more than 3 ft. away from the end of the load.

Reason.—The present figure shows the method of loading uniform widths, but is silent on assorted widths, lengths or shapes.

Fig. 47

Item C—Under number of pieces, it is shown that two are required for each pair of Item B. This, we feel, should read one.

Reason.—The figure in sketch No. 1 shows one strap Item C and 1 strap Item D for each pair of rods.

Fig. 56

The committee recommends that Item M be of 6-in. by 8-in. hardwood to be held in place directly under Item E with two ⅜-in. by 6-in. by 12-in. plates, one on each side of Items M and E, fastened with two ⅝-in. by 10-in. bolts through Item M and plates, and one ⅝-in. by 10-in. bolt through Item E and plates. Bottom of Item M fastened to Item B with two 3-in. by 3-in. by 6-in. by ½-in. angles, one on each side of Item M with two ⅝-in. by 10-in. bolts through Item M and angles and four ⅝-in. by 5-in. lag screws, two on each side in Item B and angles, one ½-in. by 7-in. split bolt near bottom of Item M, Item M not required on loads less than 30 in. high except when height of load exceeds width.

Reason.—Present size 4-in. by 6-in., spiked to Items E and B, do not stay in place, causing same to break, resulting in cars being shopped. If 6-in. by 8-in. material is used and fastened as outlined, same will stay in place and serve the purpose intended for Figs. 48, 49, 50, 52, 53, 54, 57, 58, 59, 60, 61; Items H, O, P, F, H, J, M, O, M, K and O, respectively, these items being the same as shown for Fig. 56.

Fig. 56-A

The committee recommends flexible material loaded as double loads be tied down as per Fig. 56, page 141. (It now permits loading of flexible material as double loads without being tied down at bearing pieces, merely having two 2-in. by 6-in. by 10-in. cleats nailed on top of bearing piece on each side.)

Reason.—Necessary to eliminate excessive shifting. A great deal of trouble is being experienced with heavy sheet steel loaded in gondola cars where the total space between load and sides of cars is more than 18 in. On the banded loads the bands are breaking and side blocking is becoming displaced and loads are shifting to one side. On this heavy sheet, the bands are not of much use, as in most cases some or all of them are broken and the present requirements for side blocking are not sufficient. It is recommended that consideration be given to the elimination of bands for this type of load and provide for more substantial side blocking.

The report was submitted by E. N. Myers (chairman), chief interchange inspector, Twin City Joint Car Inspection Association, St. Paul, Minn.; H. T. DeVore, chief interchange inspector, Youngstown Car Inspection Association, Youngstown, Ohio; H. H. Golden, supervisor, A. A. R. interchange and accounting, Louisville & Nashville, Louisville, Ky.; L. T. Donovan, inspector of loading, A. A. R., Pittsburgh, Pa.; T. E. Hart, supervisor of loading and interchange, New York, Chicago & St. Louis, Cleveland, Ohio; W. P. Elliott, general foreman, Terminal Railroad Association of St. Louis, East St. Louis, Ill.; S. C. Montgomery, general foreman car department, Illinois Central, Memphis, Tenn.; W. A. Emerson, general master car builder, Elgin, Joliet & Eastern, Joliet, Ill.; F. Cebulla, general car foreman, freight equipment, Great Northern, St. Paul, Minn.; and N. Arnold, general car inspector, Missouri Pacific, Kansas City, Mo.

The Selection and Training of Supervision

Qualifications to look for in men selected for promotion—Opportunities for preparation which can be offered to foremen candidates

J. E. Keegan, Chairman

It is of the utmost importance at this time, with the great task confronting the railroads, that the selection and training of car-department supervision be most carefully done. In selecting men for this important work there are many things to be taken into consideration. The most important of these are appearance, physical condition and personality, general knowledge of car construction and maintenance, willingness and ability to transmit this knowledge to others, leadership, responsibility, the desire to cooperate, ambition, and loyalty to his employers.

During the present emergency, the labor situation will become more and more acute. It will be necessary to use men on mechanical work such as car repairing, inspecting, on machine work, welding, etc., whose knowledge and experience is limited. It will be the duty of the supervisor to teach these men and to know that the work done by them is properly done. With the immense amount of traffic being handled by the railroads, the great necessity that rolling stock be in proper condition so that traffic will not be delayed by car failures and that loaded cars move without delay due to defective condition, cannot be too strongly stressed.

It is preferable to select younger men who have served an apprenticeship. They have obtained a general knowledge of car construction and maintenance and have demonstrated by their ability to complete an apprentice course that they have the ambition to continue as carmen. However, many very competent supervisors have been selected who have not had the advantage of apprentice training. Very often a repairman, inspector, etc., will demonstrate by his actions that he is qualified for consideration as a supervisor.

A prospective supervisor should at first be given a trial by being assigned as a gang leader or gang foreman to fill temporary vacancies among the regular supervision. This will demonstrate his ability as a leader. During this time he should be given an opportunity to

read blueprints, reports, correspondence, become thoroughly familiar with A. A. R. rules of interchange, loading rules, and mechanical instructions issued by his company. He should also become familiar with the proper procedure in obtaining material. Safety First must be impressed on him. He should be given special assignments in investigations and developing tools and devices which are so necessary for the efficient operation of car shops. He should be sent out on the road to obtain information and check operations. Reports prepared by him will give an insight into his ability to carry out instructions. It is advisable to start the preliminary training if possible at a larger shop where he will be under the direction of experienced foremen. When the opportunity permits he should be assigned as a permanent gang leader or gang foreman.

The proposed supervisor should then be sent to a smaller shop as foreman. This will develop his sense of responsibility and demonstrate his ability to cope with situations that will test his ingenuity and resourcefulness. Here the necessity of cooperation with other departments will be impressed on him. Very often the activities of a foreman at some small point have been brought forcibly to the attention of his superiors, which has reacted greatly to his credit.

If the supervisor has shown the proper ability, he should be transferred to a larger point as assistant foreman so that he will become experienced in handling a larger volume and variety of work such as that at freight yards, passenger yards, heavy interchange points, etc. He will thus obtain a general knowledge of car department work.

It is desirable to hold meetings between car department heads and foremen, assistants and other supervision to exchange ideas and to know that various car department matters are thoroughly understood by all concerned and are being observed. Foremen should be encouraged to attend meetings of local associations of car men. Such meetings are educational and it is greatly to the advantage of car-department supervisors to know and to cooperate with the supervision of other railroads in their locality. Much can thus be done in expediting the movement of the many commodities of war which is of such tremendous importance today.

The report was presented by J. E. Keegan (chairman), chief car inspector, Pennsylvania, Chicago.

Roller-Bearing Experience on Passenger Cars

What the bearings accomplish—Methods of inspection and maintenance—Kind of lubricants required—Causes of bearing failures

Ebert Photo

C. P. Nelson

Admittedly the logical prospect for anti-friction bearing applications, the railway journal bearing has been one of the last to be successfully fitted. This condition has been due primarily to the tremendous loads and constant pounding to which the bearings are subjected even in ordinary service and in part to the reluctance of railway officials to experiment where failure of the part being fitted might jeopardize human life. Predominant among advantages resulting from the installation of roller journal bearings are the large reduction in initial starting effort, an average reduction of 10 per cent in running effort under all conditions and a marked drop in maintenance costs. Thus, it is not only possible to haul heavier trains with existing locomotives but because accelerating periods are decreased, maximum speeds can be lowered without affecting existing schedules. Shorter acceleration periods and lower maximum speeds make for more profitable operation because of the decreased fuel or power consumption per ton mile.

Twenty-five years of discussion on the subject of roller journal bearings by bearing manufacturers have definitely brought to the foreground certain requirements which must be met by the designer, namely: (1) ample capacity to carry all loads encountered without heating; (2) positive lubrication at all speeds and temperatures; (3) lateral adjustment possible when made necessary by truck wear or distortion; (4) simple installation and maintenance; (5) interchangeability with A. A. R. equipment.

Back in 1934 was launched an epoch-making experiment—the introduction of the first streamline train. Developed in an effort to check the alarming decline in rail travel caused by the bus and private automobile, the lightweight, high-speed train represented a combination of the structural engineer's ingenuity and the streamline designer's skill. Today there are more than sixty such trains operating in every section of the country. Over fifteen million passengers have been handled, yielding well over four billion passenger miles with speeds averaging from 90 to 110 miles per hour—almost breathtaking proof of the successful efforts of the railways to promote passenger progress.

The sustained high speeds and high daily mileages of modern service make anti-friction journal bearings a necessity. Bearing reliability is now by far the most important requirement. It dictates every phase of bearing design and manufacture and receives first consideration by motive power and car departments in bearing selection. The reliability of the various types of anti-friction bearings have been thoroughly proved in service under high speeds and for satisfactorily high total mileages. Their simplicity and massive proportions insure satisfactory performance under modern operating conditions.

New materials in car construction, air conditioning,

and the features of both exterior and interior design and appointments for passenger appeal have influenced car departments to make investments in costly new equipment which demands the greatest utilization. Maintenance which formerly may not have caused serious interruptions of service or even burdensome expense is now intolerable. The new and attractive but costly equipment must be in and out of terminals on the closest schedules that traffic will support. This means that mechanical devices used thereon must operate for long periods of high mileage with very little attention.

The satisfactory operation of journal bearings is absolutely necessary to the success of the new equipment. Only anti-friction bearings can withstand the severity of the service. Roller bearings have proved their reliability. As modern as the most modern of equipment, roller bearings embody every advance in metallurgy and every improvement in design to provide the longest possible trouble-free service life. They are designed in various shapes and sizes—spiral, spherical and tapered rollers with races and box constructions meeting their specific requirements, each design made to satisfy the requirement that a special lubricant be not necessary, that oil consumption be low and the need for inspection infrequent.

Thorough knowledge of service conditions, long experience with many installations and continuous engineering development are reflected in the design and construction of all roller bearing parts including races and housings, every feature having been studied and subjected to a thorough test before adoption.

Terminal Inspection and Maintenance

It is generally conceded that all roller journal bearings, regardless of type or manufacture, receive somewhat the same attention insofar as terminal inspections are concerned. Immediately upon arrival of trains at the established terminals the roller bearing boxes are felt with the bare hand to determine the approximate temperature. Running temperatures varying from 15 deg. to 50 deg. F. above that of the atmosphere is considered normal. Temperatures in excess of the latter warrants further inspection, to the extent in some instances of removing wheels and the complete dismantling of boxes in the endeavor to locate the origin or cause for the excessive heating.

Pipe plugs, bolts and nuts are checked each trip to determine if tight, the boxes carefully examined for any service condition that may have caused damage to the box or parts. Oil levels are checked daily with gages provided for this purpose. If oil level is close to the minimum marking on the gage a sufficient amount of oil is added to bring the oil up to the maximum marking. If the oil appears to be discolored or indicates presence of dirt or moisture, the lubricant is drained and the box is flushed out with hot oil or kerosene, then being refilled to capacity with clean oil. The presence of any metallic substance in the oil prompts a removal of the wheels and dismantling of boxes. Many railroads have a practice in effect whereby boxes are checked periodically for water content in the oil—this being done by opening the drain cock slightly and allowing condensed water to escape. It was also found that certain railroads arbitrarily remove box covers in the train yard semi-annually, preferably in the spring and fall, for a visual inspection of roller bearings, cleansing of boxes and refilling with new oil.

Oil should be renewed at wheel turnings, wheel renewal or when wheels are stripped for axle inspection. In some sections of the country where extremely cold temperatures are encountered for long periods of time it is often necessary to thin the regular oil to assure fluidity. This should be done by adding a quantity of lighter oil. Kerosene should never be used as a thinning agent. A partial inspection of the bearing, so far as is possible, should be made at each wheel turning. When wheels are renewed, the bearings and housings are removed from the axle and at this time they should be thoroughly cleaned and inspected.

Kerosene or a commercial solvent may be used to clean the bearings, housings and smaller miscellaneous parts. Some roads, which are operating a large number of roller bearings, find it economical to clean both bearings and boxes in a bath of hot caustic solution. If this method is used, the bearing and box should be rinsed in hot water and steam jet to remove all traces of the caustic. The parts should then be thoroughly dried and covered with a light coat of oil to prevent corrosion while waiting for inspection and re-application. Under no circumstances should waste ever be used to clean bearings or contained parts. The use of rags or a soft brush is advocated. For the lubrication of roller bearings, our experience has shown that a well-bodied mineral oil should be used to the following specifications: Flash Point, not below 500 deg. F.; gravity at 60 deg. F. not below 22 deg. F. Baume; viscosity at 210 deg. F., 125-150 sec.; cold test, not above 30 deg. F.

Loss of oil from boxes can be attributed in a majority of cases to irregular tread wear of wheels, worn boxes, pedestals and liners as well as loose retainer bolts.

Lessons From Roller-Bearing Failures

To speak of the failures which have occurred is always distasteful, often unpleasant and sometimes downright embarrassing. Yet only through study of such deficiencies can real progress be made in the ultimate improvement of roller bearings and their correct maintenance. With no intent of avoiding responsibility, but simply to keep the record straight and to furnish a legitimate point of departure for an analysis of bearing failures, it should be stated at the outset that a reasonable percentage of the defects in service must be attributed solely to causes beyond the control of the bearing manufacturer—in other words, purely and simply the fault of the user. With this in mind, the bearing manufacturers have done their utmost to better acquaint all users with the "do's and don'ts" of bearing care and maintenance—particularly in the current period of near-shortages and vital need for high production.

Some of the more common causes of failure are dirt and abrasives, faulty lubrication, mis-alignment, improper mounting and overload. Of these the greatest is dirt —public enemy number one in the life of a roller bearing. Any foreign matter other than the proper lubricant is to be construed as "dirt" incidentally, and it may gain entrance during assembly, repairs, from the atmosphere, or even as adulterants in the lubricant itself. A not-too-untypical analysis, for example, of the materials which get into a bearing while in service shows particles of metal, grit, sand, sawdust and graphite which act as an effective grinding compound. This has led many railroads to adopt a magnetized filling plug in the endeavor to draw out minute metallic particles from the oil.

A roller journal bearing, correctly applied and properly lubricated, offers trouble-free service. It sometimes happens that wheels are changed or turned and bearing installations removed and reapplied so that the assembly is made in accordance with the specific maintenance instructions. There have been cases where bearing applications have been placed in service without lubricant in the boxes or housings. No bearing can be

expected to operate for any length of time under such conditions. It will heat up and be completely destroyed unless the trouble is detected promptly.

In order to enable engine or train crews to detect these and other abnormal operating conditions before serious damage has been done, heat indicators have been developed and used on the boxes. This device has been aptly termed a "stench bomb" and consists of a cylindrical container holding a liquid (mercaptin) which when heated gives off an extremely pungent and penetrating odor. The container is sealed with a bismuth solder plug. If for any reason the temperature inside the bearing boxes exceeds 220 deg. F. the plug melts instantly, releasing the stench agent to the atmosphere. When the resultant odor is detected, the train is stopped at once and the overheated bearing located. With this procedure no material damage should ensue. An examination is then made to determine the cause of the overheating and proper precautions are then taken before operating the equipment further. When equipment reaches the shop or terminal all parts of the bearing application should be thoroughly examined and repairs made. Tests have proved that the odor from the heat indicator can be detected in air-conditioned equipment operating at high speeds and will remain in the cars from 10 to 15 minutes. These indicators however are gradually being supplemented by the electrically operated journal-box alarm, which transmits a signal to the car interior if any box develops an abnormal temperature. These methods are proving successful in preventing failures, the origin of the overheating being quickly located and corrected.

We find it unimportant to discuss methods pertaining to the mounting and assembling of roller bearings as well as the checking of lateral for the reason that these practices vary with the different types of bearings in use, the manufacturer ably covering this phase of the operation and maintenance with printed and illustrated instructions for the guidance of the carriers.

The report was submitted by C. P. Nelson (chairman), assistant superintendent car shops, Chicago & North Western, Chicago.

Keep Down Detentions of Cars in Bad Order

More use of bad-order-when-empty card suggested—Extend repairs made when cars are empty—Inadequate facilities no excuse for failure

It is highly essential now, more than ever before, that carmen exercise every effort to reduce the detention of cars in bad order to the lowest possible point. Your committee feels that no car should be loaded, which will not, except in the unusual case, carry its load to destination and we are fully in accord with the work being done by special committees at many terminals under the direction of the A. A. R. Mechanical Division. Campaigning in this manner, i. e., to get all required repairs made when cars are empty, will naturally result in the elimination of subsequent bad-ordering of cars shortly after having been released from a repair track. If and when this is done it will materially reduce the detention of cars on account of being in bad order.

Knowing that we have not yet reached the desired goal, we strongly recommend that every effort be put forth by car-department supervisors to differentiate between defects which require the shopping of loaded cars and those which may be allowed to run until the car is made empty. Relying on the experienced judgment of competent carmen, we feel that they will rise to the opportunity of utilizing their experience for the continuous, dependable movement of traffic during times such as these.

As a further stimulant to emphasize the importance of letting loaded cars move to destination without interruption, the suggestion is advanced that more general use should be made of the bad-order-when-empty card, it being felt that this would serve two purposes: First, that the defects would be repaired before cars are reloaded; second, that it would continually keep the car inspector mindful of the fact that loaded cars must not be shopped unless absolutely necessary.

Further study in connection with this subject develops that many cars are being unnecessarily detained, both in sending to repair tracks after being shopped in transportation yards and in extension of repairs after the cars have been set. Where this condition prevails, invariably no practice is in effect whereby the repair track supervisors have any knowledge of how many bad-order cars are being held out for placement, when they were bad ordered or when they might be set, depending entirely on the transportation department of the service to get them set on the repair tracks. Some cases are noted where this information is available at the end of the shift or day. However, in many cases, several hours of detention accumulate before the repair-track supervisor knows that the cars are bad order.

We recommend that this association go on record as favoring the use of a standard form to cover bad-order cars, this form to be furnished as information to all concerned and show the car initial, car number, date and time bad ordered, date and time placed in shop, date and time ok'd, and detention hours if so desired.

Summing up our observations we believe that adherence to the following suggestions will materially help obtain desired results:

(1) Education of inspectors and others as to the necessity for minimum shopping of loaded cars.

(2) Extension of all necessary repairs to empty cars placed on repair tracks for so-called light and running repairs, including periodical attention to journal boxes and air brakes, gaging of parts condemned by certain gages, etc.

(3) Adequate record or report to cover bad order cars to insure prompt switching to repair tracks, prompt repairs and returning to service.

(4) Rigid inspection of open-top cars at originating points to insure better compliance with the loading rules.

(5) Extension of assigned seven-day forces to meet present requirements.

(6) General and heavy repair programs commensurate with service requirements, with removal of only sufficient cars from service required to keep the program moving.

(7) Building of cars designed to meet the specification of the A. A. R.

Obviously the question of existing facilities and forces

was discussed in connection with submission of this report. Your committee feels that, while in some cases improvement is desirable, due to present conditions and those of the immediate future, it is incumbent upon us as railroad men and as carmen to do the job well with what is available, utilizing each facility to its fullest extent. In connection with the whole war effort, cars must and will be repaired promptly and dependably under much more trying conditions than have heretofore existed and we must go slow in excusing questionable performance and unnecessary detention of cars in bad order for lack of more desirable facilities. This committee sincerely hopes that no one, at this time will use the lack of facilities as an excuse to cover up excessive detention to cars in bad order but that ways and means will be found to decrease the time heretofore consumed.

The report was submitted by H. E. Wagner (chairman), division general car foreman, Missouri Pacific, Dupo, Ill.

Interchange and Billing for Car Repairs

Changes recommended in rules to simplify interchange inspection and reduce paper work required of car inspectors

The committee recommends the following revisions in the existing interchange rules which are submitted for consideration by the Arbitration Committee of the A. A. R. Mechanical Division. These proposed changes will become effective only if and when they have been officially approved by the Mechanical Division.

Freight Car Rules

Rule 4

Relocate Par. (a) as Par. (b) which is eliminated.

Substitute the following for Par. (a): All reference in these rules to "Delivering Company responsible" shall apply to non-per-diem cars only, excepting such per-diem cars as are damaged to the extent of the various provisions of Rule 44 and all cars damaged to any extent when involved in an accident sufficiently extensive to be properly reportable under the provisions of the regulations of the Interstate Commerce Commission as to reporting accidents. All other damage to per-diem cars shall be "Owners responsibility." Defect cards for damage to per-diem cars, the responsibility of the delivering line, must be affixed to cars prior to their movement from scene of accident or prior to their movement from repair point should it be necessary to send the cars to a repair point for temporary or partial repairs. All defect cards issued for per-diem cars must bear the notation "Home for Repairs."

Reason.—It is a well-known fact that there is included in the per-diem dollar an amount to cover all maintenance due to ordinary wear and tear as well as that due to unfair usage. With such factor included, the user or foreign handling line, through the present method of assessing responsibility for delivering line damage, pays twice for maintenance, first through the payment of the established per-diem rate and secondly through the bill based on his defect card. It is to remove this unfair distribution of the maintenance expense that this suggestion is made. It is further suggested that there will be much needed relief for interchange car inspectors, particularly at this time of needed speeding up of transportation, by eliminating the necessity of every interchange car inspector closely inspecting all cars, regardless of ownership, for what is now termed delivering line damage, and the writing of defect cards or the copying thereof, that his company's interests may be protected. At this time, when we are more concerned with safe train movement than with division of responsibility, it is felt that all efforts of the car inspector should be directed toward safe train movement. This reclassification of defects will give car inspectors the necessary time for more thorough inspection.

Rule 9

Change the item now worded "A. A. R. couplers, or parts thereof, R. & R." to read "A. A. R. couplers, R. & R.," eliminating the words "or parts thereof."

Eliminate from opposite this wording, "Top or bottom operated." Eliminate from opposite this wording the "Note," relocating it as hereinafter recommended.

Establish a new item worded "Coupler knuckle, R. & R." Establish requirements for coupler knuckles as, New or secondhand and type. Depth of knuckle face (9 in. or 11 in.).

Relocate Note now appearing opposite wording "A. A. R. couplers, or parts thereof, R. & R.," locating it opposite this recommended new item, "Coupler knuckle, R. & R." Establish a new item worded "Other coupler parts." Establish requirement for other coupler parts as, New or secondhand and type.

Reason.—To eliminate unnecessary wording on repair cards, the present requirements necessitating the writing of much detail for knuckles and other coupler parts that is of no use whatsoever.

Rule 10

Revise the first paragraph to read: In noting the cause of removal of wheels and axles, the terms shown in Rules 68 to 86, inclusive, or the A. A. R. recommended practice symbols for marking defective wheels, shown on pages 159, 160 and 161, must be used. Both may be shown, however; the omission of either from the billing records will not justify exceptions to charges.

Reason.—To permit showing symbols alone, if desired, reducing the volume of writing in the compilation of billing records.

Rule 17

Revise the second paragraph of Sec. (e) Note 5 to read: This also applies to beams having third-point suspension feature if car is equipped, at two or more beam locations, for functioning of this type of suspension.

Reason.—Most lines are purchasing all brake beams with third-point suspension jaw cast integral with strut, and, in the application of such beams to foreign cars, transfer the four-point sliding chairs from the removed beam to the applied beam. Under the present rule, where two such beams are applied, the standard of the car is changed without the owner's intention. Beams subsequently applied are then equipped with third-point slid-

ing chair and a charge rendered against the car owner. The standard of the car established by the suspension members should be the governing feature and not the attachments to the brake beam.

Reword the question in Interpretation B-6 to read "If defective geared hand brake meeting requirements of A. A. R. specifications is removed from a foreign car," etc.

Reason.—To eliminate the necessity of repairing lines holding for disposition old style obsolete brakes, disposition not being furnished, the ultimate result, after incurring expense of correspondence, being the placing of such brake parts in the scrap. It is felt that only those brakes that meet A. A. R. specifications should be held for owner's disposition.

Eliminate the second paragraph of the answer to the question in Interpretation C-2. Eliminate in its entirety Interpretation M-10.

Reason.—Few owners find it economical to take advantage of these provisions permitting the return of material. Their inclusion in the rules only occasions unnecessary correspondence, expense of handling line for storage and handling, and delays the return of scrap to a usable source.

Rule 60

Reword Par. (f) with reference to stenciling location and provide that stenciling shall be located on car body near the body bolster at diagonal corners adjacent to the journal box repacking stencil.

Reason.—To place the stenciling in clear view without going underneath the car to clean off the brake reservoir, and to make the checking of the air brake date and the journal box repacking date at one glance and without the necessity of passing to the opposite side of the car should the inspector be on the side opposite to the reservoir.

Eliminate Sec. (j) in its entirety and revise Sec. (k) to read as follows: Charge for cleaning air brakes within the 14 months' time limit is now permissible on account of renewal of defective air reservoir on detachable type equipment, or cylinder gasket on detachable or combined type equipment.

Reason.—The rule as now written leaving the decision about cleaning brakes, or renewing certain defective parts causing the brakes to be inoperative to the discretion of the repairing line is causing considerable annoyance since, for example, the repairing line may do a perfect job in cleaning brakes and yet be required to cancel its charges because a cylinder gasket tested and meeting all test requirements happens to fail within the 60-day limit. Then, in other instances, the practice of some repairing lines in renewing certain parts now permitted by the rules, instead of cleaning the brakes, is being, by the car owner, contrasted, with the practice of other repairing lines which, instead of renewing certain permissible parts, clean the brakes. This comparison is used in an effort to force the latter line to reduce its charges to what the charge would have been had the permissible items been renewed instead of the brakes being cleaned.

The rule should be so worded as to make for uniform procedure and reduce controversies about charges to a minimum.

Add an additional note to Sec. (m) as follows: Cleaning periods herein established are not applicable to cars the brake system of which is under observation and study, identified as "Experimental-Test," or "AB Brake —Experimental." Such brake equipment must be handled in accordance with circular DV-797 and reprinted in circular DV-829.

Reason.—To avoid delays to such cars by reason for car inspector's sending them to the repair tracks on account brakes out of date. While all member lines have the instructions contained in the circulars referred to and those in a supervisory capacity are aware of the provisions thereof, it is doubtful that all car inspectors are conversant with the instructions. It is felt that reference thereto in the interchange rules will result in complete information pertaining to the subject being passed on to the car inspectors.

Revise the air-brake markings cut, pages 124 and 125, in accordance with recommended change to Sec. (f), Rule 60.

Rule 63

Reword the last sentence of note following Sec. (c) to read: "Worn brake heads without such wear plates may have same applied when distance between lugs has reached 2 in., for which charge in permissible."

Reason.—To refrain from the application of wear plates until, by reason of wear, the distance between lugs has reached 2⅛ in. is wasteful. To conserve material wear plates should be permitted and encouraged just as soon as sufficient wear, enabling the insertion of the thinnest wear plate is possible.

Rule 66

In Par. (c) of this rule, provide for 1½ in. stenciling instead of 1 in.

Reason.—To make a uniformity as to stenciling for air brakes and journal box repacking.

Rule 69

Revise Par. (a) to read: In machining wheels and axles, and the mounting of same for interchange service, the A. A. R. standard wheel shop practices as published in the Wheel and Axle Manual must be followed. In addition thereto, and etc.

Reason.—Effective date of adoption is immaterial, however it is thought the rule should state where the requirements can be found, i.e., the Wheel and Axle Manual.

Rule 98

Revise Sec. (c) Par. 5 to read: Serviceable experimental cored hub wheels marked "A. A. R. X." when removed from service on account of defect in axle or mate wheel, shall be credited as scrap except when removed on account of Rule 32 or Rule 84 condition (responsibility of repairing line), in which event secondhand credit must be allowed for such undamaged wheel or wheels. Such wheels when subject to scrap credit shall be held and disposition requested from car owner. If car owner elects to have wheels returned, freight charges collect, shipping instructions must be furnished within thirty days from date of notification. No credit should be allowed for wheels so returned.

Such undamaged wheels removed on authority of defect card (other than repairing lines card) shall be credited as scrap and reported as "Scrap per Par. 5 Sec. C, rule 98. The line against which the defect card is issued shall, upon receipt of bill, authorize the car owner to bill for secondhand value of such wheels."

Rule 101

In Item 172, transfer labor, per hour, from this material rule to Rule 107, the labor rule.

Reason.—For more ready reference.

Rule 112

Amend Sec. A, Par. 1 (a) as follows: Following the

(*Continued on page 495*)

Locomotive Maintenance Officers' Association

J. E. Goodwin,
President

The problems of those responsible for the maintenance of motive power are discussed in three reports to the association which deal with the selection and training of supervisory personnel, wartime maintenance of locomotive air-brake equipment, and a survey on metal cutting tools

WITH locomotive mileage soaring each month to new heights the necessity of restoring that run-out mileage through repair programs has placed on the repair forces of the back shops and enginehouses a responsibility of such proportions as to leave very little time to devote to matters other than running the railroads. Recognizing, however, that the only substitutes for shortages of men, facilities and materials are the more efficient utilization of those we now have, the Locomotive Maintenance Officers' Association committees and members collaborated in the preparation of reports, which are presented here, on several subjects of vital importance at this time.

The report of the Committee on the Selection and Training of Supervisory Personnel covers this important phase of mechanical-department work in a comprehensive manner, including many suggestions of real practical value. The maintenance of air brake equipment, contributing as it can to the elimination of road failures, is treated in a second report.

F. J. Topping,
First Vice-President

S. O. Rentschler
Second Vice-President

C. D. Allen,
Third Vice-President

C. M. Lipscomb
Secretary-Treasurer

Advisory Board Members

D. S. Ellis,
Chief Mechanical Officer,
Chesapeake & Ohio

O. A. Garber,
Chief Mechanical Officer,
Missouri Pacific Lines

J. Roberts,*
Chief of Motive Power and Car Equipment, Canadian National

P. O. Christy,
General Superintendent Equipment,
Illinois Central

D. J. Sheehan,
Superintendent Motive Power,
Chicago & Eastern Illinois

Wartime conditions, with the resultant shortages of materials and supplies, is causing many a hardship and in the railroad shop, where such a large and important part of the work depends upon machining operations it was but natural to expect that, with defense industries demanding an ever-increasing supply of the high-production metal-cutting tools, the railroads might have to take the short end, so to speak. However, the conditions that have existed in the past year have proved to be a blessing in disguise and the report of the Committee on Shop Tools, dealing with the cutting-tool problem, presents a survey of a situation in the shop field that can be used to advantage by every shop man who has anything to do with the machining of metals.

A fourth committee has in preparation a report on the facilities required for the maintenance of Diesel-electric locomotives. Unfortunately this report could not be completed in time for presentation in this issue.

Officers of the Association

Under the terms of the association's constitution the elective officers and executive committee members will hold over. The officers of the association are: president, J. E. Goodwin, mechanical superintendent, Missouri Pacific, St. Louis, Mo.; first vice-president, F. J. Topping, master mechanic, Chesapeake & Ohio, Hinton, W. Va.; second vice-president, S. O. Rentschler, shop superintendent, Missouri Pacific, Sedalia, Mo.; third vice-president, C. D. Allen, master mechanic, Chesapeake & Ohio, Silver Grove, Ky., and secretary-treasurer, C. M. Lipscomb, assistant to production engineer, Missouri Pacific, North Little Rock, Ark. The members of the executive committee are : F. J. Topping, (chairman) George Crowder, superintendent motive power, Georgia & Florida, Douglas, Ga.; E. J. Kueck, mechanical engineer, St. Louis, Southwestern, Pine Bluff, Ark.; W. P. Buckley, shop superintendent, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.; W. E. Vergan, supervisor air brakes, Missouri-Kansas-Texas, Denison, Tex.; G. A. Silva, shop superintendent, Boston & Maine, North Billerica, Mass., and G. E. Bell, general foreman, Illinois Central, McComb, Miss.

The association's advisory board consists of P. O. Christy, general superintendent equipment, Illinois Central, Chicago; D. S. Ellis, chief mechanical officer, Chesapeake & Ohio, Pere Marquette and Nickel Plate, Cleveland, Ohio.; O. A. Garber, chief mechanical officer, Missouri Pacific, St. Louis, Mo.; J. Roberts, managing director, National Railways Munitions, Ltd. (formerly chief of motive power and car equipment, Canadian National) Montreal, Que., and D. J. Sheehan, superintendent motive power, Chicago & Eastern Illinois.

* Mr. Roberts is now managing director of National Railways Munitions, Ltd.

Wartime Maintenance of Air Brake Equipment

Standards of inspection and maintenance should be higher under present conditions to insure against failures

By A. Malmgren

Road Foreman of Equipment, St. Louis-San Francisco, Springfield, Mo.

A. Malmgren

The necessity of meeting the transportation demand of the present, wherein the railroads of the United States are a part of our national defense system, requires that locomotive air-brake equipment be given more rigid tests preliminary to being despatched, that the representatives of management and the operators of equipment know that it is functioning properly within a range of insured safety. We cannot, at the present time, relent in our efforts to maintain a high degree of efficiency in the maintenance of brake equipment, because later we may be called upon to release trained personnel to the armed services and replacement will take months, even years of special training. During this training period, there will be a lower standard of maintenance. Too, we are being called upon daily to repair and keep in service more of the older equipment due to material shortage.

Maintenance means the dismantling, cleaning, repair and replacement of any of the working parts that are not functioning regularly or that can not be depended upon to function at all. It has been suggested by some that we ease up on tests at inspection periods so that equipment can remain in service during these troubled times, when material and man power are badly needed in other fields. No other field is any more important than the transportation field. I once heard a prominent speaker say, "There is no such a thing as a shortage of food, when one half of the world is starving for things that the other half of the world is over-producing. What is needed is a better system of transportation." To get better transportation, we must maintain our locomotives at a high standard so the operator of the equipment can place dependency on the equipment to function properly.

The most disheartening task confronting an engineman when handling the fast trains of today, is to have the brake equipment fail to apply properly or apply in emergency when only a service application was intended. An engineman may be ever so clever in his practical knowledge of the air-brake system—every feature of its construction, function, relation and operation—but if the equipment is not properly maintained, all his experience, knowledge and training go for nothing. Faulty functioning of equipment results in the loss of schedule time, reflects on the low standard of maintenance and encourages the repairman to continue to neglect his duty.

Here is a list of the various tests of the locomotive air-brake equipment that has proved helpful on our railroad and will prove helpful to others.

Before despatching a locomotive, the supervisor in charge must know that the engine and tender air brakes, signal equipment and air-operated devices have been inspected and tested and are in a safe and suitable condition for service; that the compressors are in condition to provide ample air for the service for which the locomotive is to be used; that the devices for regulating or controlling pressure are functioning properly; that brake valves work properly in all positions; and that all the water has been drained from the air-brake system. Examine carefully the cab cards, noting that cleaning dates of the various parts of the equipment are not past due. Measure the piston travel and examine the foundation brake rigging, reporting irregularities which must be corrected. At least once each month, unless otherwise instructed, all compressors, except the 8½-inch cross-compound compressors, should be laundered, strainers cleaned on locomotives not equipped with the Type C filters, and orifices checked.

Periodic Inspections

In addition to daily and monthly inspections and test, the following quarterly inspection and test should be made. Test all air gages on the dead-weight tester, dismantle, clean, test and adjust compressor governor and feed valves, dismantle, clean, and test the vent valves.

In addition to the preceding inspections, the following inspections must be made on each six months' period. Dismantle, clean and test brake valves, control valves, distributing or triple valves, emergency relay valve, double checks, safety valves and signal equipment.

On annual inspection dates in addition to the tests outlined in daily, monthly, quarterly and semi-annual inspections, all the reservoir must be subjected to a hydrostatic test and hammer test.

Classified Repairs

All brake cylinders must be overhauled when locomotives are undergoing classified repairs. Brake cylinders must be replaced when the diameter of the cylinder exceeds the original diameter 3/32 in.

Daily Comparison Test

Apply standard test devices to the brake pipe and signal hose; see that the locomotive air gages are tight on the brackets and that the dial glasses are clean and tight; make sure that the dials are readable and that pipes are properly connected and have no leakage. Place the automatic brake-valve handle in release position and note whether or not there is more than 2 lb. variation between main-reservoir, brake-pipe, equalizing-reservoir and test-device gage hands. Should there be more than 2 lb. variation, gages must be removed and corrected. Brake-pipe and equalizing-reservoir gage hands should compare within 2 lb. of that of the test gage at the following

pressures: 90 lb., 70 lb. and 50 lb. Make a 10-lb. brake pipe reduction and brake-cylinder gage hand should indicate approximately 25 lb., increase brake-pipe reduction to 20 lb. and note that the brake-cylinder gage hand increases to approximately 50 lb. A more accurate method for testing the brake-cylinder gage is to attach a test gage to the pressure head of the brake cylinder and compare the engine brake-cylinder gage reading with that of the test gage. Locomotive air gages must be tested at least once each three months; also when any irregularity is reported. Gages found incorrect in reading should be corrected before they are returned to service.

Automatic Control, Distributing and Triple Valve Tests

(a) Have the automatic brake valve in running position and know that the equipment is fully charged. (b) Open $\frac{3}{64}$-in. orifice in the test device; then place the automatic brake valve in lap position. (c) Engine and tender brakes should apply within the first 5 lb. of brake-pipe reduction. If the brakes do not apply, repeat the above test except that the automatic brake valve should not be in lap position; instead, close the double-heading cock and see that the brakes apply within the first 5 lb. of brake-pipe reduction. Should the automatic control valve, distributing valve or triple valve fail to pass the above test, it should be removed and repaired. Control valves, distributing valves and triple valves should be cleaned as often as conditions require to keep them in a safe condition for service, but not less frequently than once each six months.

Brake Rigging

Note that the foundation brake rigging is maintained in a safe and suitable condition for service; that all levers, rods, brake beams, hangers, and pins are of ample strength; that they do not foul in any way that will affect the proper operation of the brakes and that they clear the rail at least 2½ in., and preferably 3 in. or more. See that all pins are properly secured in place with cotters, split keys or bolts. See that brake shoes are properly applied; not worn out; secured by a brake shoe key and are in line with the tread of the wheel.

Brake Valves

Automatic, independent and straight air: Move the handle to all positions to make sure that the handle operates easily. If it does not, lubricate the valve, key gasket, and handle latch. In case the brake valve is hard to operate after being lubricated, it should be removed, cleaned and repaired. The brake valve should be securely anchored and pipe connections tight. A constant blow at the service exhaust port of the automatic brake valve when the handle is in release or running position, indicates that the equalizing discharge valve has dirt under its seat or the valve is defective. In many cases the dirt can be removed or blown off the valve seat by making a heavy service application and then releasing. To test the rotary valve leakage, make a 20 lb. reduction and lap the brake valve. If the brake-pipe pressure increases, it indicates that either the rotary valve, brake-valve gasket or dead-engine feature is leaking.

Release Position

With the brake valve in this position, a warning port blow should be heard from the exhaust at the back of the brake valve. Open the front or rear angle cock and a strong continuous blow should be obtained at the hose and main-reservoir pressure should fall at a rapid rate.

Running Position

The compressor governor and brake-pipe feed valve should maintain the proper pressure in the main reservoir and brake pipe for the service to which the locomotive is assigned.

Lap Position

The brake-pipe pressure and equalizing-reservoir pressures should not increase above the predetermined pressure for the service to which the locomotive is assigned when the brake-valve handle is in running position. The brake-cylinder pressure should not build up and the main-reservoir pressure should be controlled by the maximum head of the governor.

Service Position

The equalizing piston should raise promptly after the handle of the brake valve is moved to service position and seat properly when the handle is returned to lap position. Also, there should be no leaks from the brake-valve service exhaust port. When making a service application, the time required to reduce the equalizing-reservoir pressure 20 lb. should be noted and must be maintained within the following limits: From 70 lb. pressure to 50 lb., 9 to 11 sec.; from 90 lb. pressure to 70 lb., 7¼ to 8¼ sec.

It should be noted while making a 20-lb. continuous reduction that an intermittent exhaust of air is obtained at the brake pipe exhaust. If only one long drawn out exhaust of air is obtained, it is an indication that the equalizing-piston ring or bushing is leaking.

Emergency Position

Note that emergency action is secured and that the discharge from the brake valve is regular. Brake-cylinder pressure should increase at a more rapid rate than that obtained with a service application and the safety valve should be functioning with the E-T or L-T equipment.

Compressor Tests

All compressors must be given an orifice test in accordance with I. C. C. Rule 107. Close the main-reservoir drain valves and start the compressor slowly; close the compressor drain valve and start the lubricator feeding. Gradually open the steam throttle to the compressor and note that the main-reservoir pressure builds up at a normal rate. Observe the performance of the compressor for even strokes; correct any leakage at the piston-rod packing; note that the compressor does not pound; see that the air-valve cages are tight; note that the steam-cylinder heads are tight and not leaking and that the air strainers are clean and tight. Know that lubricating devices are working properly for the steam and air ends of the compressor.

Feed-Valve Test

Reduce brake-pipe leakage to minimum. At no time should it exceed 3 lb. per min., using the brake-pipe gage to check. Charge the brake pipe to standard pressure with the brake valve in running position. Open the $\frac{3}{64}$-in. orifice in the brake-pipe test device. The feed valve should not show a fluctuation of more than 1 lb. from standard adjustment on the test gage. At the completion of range test, close the $\frac{3}{64}$-in. orifice, empty the brake pipe and leave the handle of the automatic brake valve in lap position. Open the $\frac{9}{32}$-in. orifice in the rear brake-pipe hose test device, close the double-heading cock and place the handle of the automatic brake valve in running position. Open the double-heading cock and note that it does not require more than 3 sec. to restore

the brake-pipe pressure from 0 lb. to 65 lb. on the locomotive gage. Observe the test gage and note that the pressure is retained above 65 lb. on the test gage.

Compressor Governor Test

To test the excess-pressure-head (low-top) and single-top governors be sure that the steam throttle to the compressors is wide open before starting the test. The automatic brake valve handle should be in the running position. See that the proper excess pressure is maintained and that the governor responds within a 3-lb. range. To test the maximum-head (high-pressure-top) E-T or L-T equipment, place the handle of the automatic brake valve in lap position. Observe that the compressor stops at the pressure to which the maximum pressure head is adjusted and that it responds within a 3-lb. range. Be sure that the governor vent port is open and not blowing excessively and know that the pipe connections are not leaking.

Signal-System Test

Determine by inspection that the signal system is free from leakage by closing the signal cut-out cock. Check the leakage with signal test-device gage. Leakage should not exceed 3 lb. per min. from a standard pressure of 42 lb. and this pressure must be maintained. Signal equipment is considered in good condition when four whistle blasts can be obtained in 30 sec. or less by opening the $\frac{3}{64}$-in. orifice in the test device intermittently.

Vent-Valve Test

Start all tests with the handle of the automatic brake valve in running position; the main-reservoir pressure at 110 lb. and equipment charged to 70 lb. Open the $\frac{9}{32}$-in. orifice in the test device and leave it open. Then, with as little lost time as possible, the operator should move to a position where he can operate the automatic brake valve easily. Move the handle of the brake valve to lap position. The rapid drop of brake-pipe pressure should cause the vent valve to open. Close the rear angle cock or orifice test cock. Move the brake-valve handle to lap position long enough to permit the main-reservoir pressure to increase to 135 lb. Then move the brake-valve handle to release position only long enough to permit the brake-pipe pressure and main-reservoir pressure to equalize. Move the brake-valve handle to service position and reduce the brake-pipe pressure to 50 lb. in one continuous reduction. The vent valve should not operate. Vent valves failing to pass the above tests should be removed, cleaned and repaired.

Cleaning and Repair

Any part of the locomotive air-brake equipment that does not meet the various tests, must be removed from the locomotive, cleaned and repaired. Cleaning does *not* mean that the operating parts just be wiped off with a clean cloth but instead the part must be dismantled, the castings put through a cleaning solution, rinsed and then allowed to stand in a vat of hot paraffin. This permits the filling of the porous part of the casting and prevents small leaks. The moving parts of the equipment should be run through a cleaning solution, the valves faced and the seats trued. Pistons and piston stems or rods are put in lathe to see that they are true. Piston-ring grooves are trued; bushings ground and rings of proper size applied. With the use of proper tools and intelligent training of repairmen, a fine finish can be applied to all frictional surfaces. By the use of a good lubricant, leakage past the sliding surfaces as well as frictional resistance between moving parts, will be greatly reduced. After assembly of the air-brake equipment, it should be given more rigid tests on a test rack than that required in service.

These are methods that are being successfully employed on our road and they have been a help not only in keeping motive power in daily service, but in bringing about a reduction in the cost of air-brake maintenance. This much every engineman, repairman, foreman and supervisor owes the management, public and government.

Report of Committee on Shop Tools

Tool conservation and the use of carbides has centered attention on the necessity for proper tool room facilities

Anneman-Mott Studio

E. A. Greame, Chairman

The report of this Committee at the 1941 meeting dealt with the experiences of a group of 23 railroads with respect to the use of high-production tool steels in the machining of locomotive and car parts. The data which were presented in that report indicated that the railroads were utilizing high-speed, alloy and carbide cutting tools on a wide variety of machining operations and were either effecting material economies in production time or extending tool life, between grinds, to entirely new limits.

In presenting last year's report to the Association, it was recognized that priority control of tool steel by the War Production Board would, in all probability, operate to limit the extension of the use of high-production tool steels, particularly of the carbide type, and that the railroads would experience such difficulties as to warrant early experimentation with substitute cutting tools. The present report was planned with the idea of finding out what substitutions have been and could be made and the manner in which they are performing.

In order to confine the scope of the Committee's survey to questions of maximum value under war-time conditions, the answers to four questions were sought. These were: (1) What difficulties have been experienced

in securing tool steels ordinarily used; (2) to what extent have the roads been able to secure carbide tools; (3) what tool steels are being used as substitutes for those formerly used, and (4) has experience with the substitutes been satisfactory?

Results of the Survey

Question No. 1—Practically all of the replies indicated that difficulties are being experienced in securing tool steels of high tungsten or cobalt content. Deliveries of supplies have been slow thereby creating a condition where means have had to be taken to solve immediate problems. That our shops and tool rooms have been equal to this task may be seen by some of the comments contained in this report. It is apparent that one of the first jobs done was a thorough house cleaning with the result that many roads found excess and discarded tools, all of which were gathered up and sent to the central tool rooms. Where solid shank tools were, in many cases, made up of high-grade steel these tools have been drawn down and applied as tips to carbon shanks with the result that the ultimate supply of tipped tools has been greatly increased. Many machine tools are equipped with tool holders of types for which it is now difficult to get tool bits. The tipped tool has helped to solve this problem. Many pieces formerly looked upon as scrap are now utilized as tips. This helps to conserve stocks of new tool steel on hand.

Question No. 2—There seems to be some conflict of opinion as to the ability to get carbide tools. In the case of some roads which reported their inability to secure carbide tools further questioning leads to the conclusion that a sufficiently strenuous effort had not been made for other roads report that, to date, they have had no difficulty whatever in getting carbide tools in reasonable quantities. One road reported a rapid expansion of the use of carbides since last year and, in replying, stated that "the use of these tools is limited only to the extent to which we can train our men in their proper grinding and use. In several shops carbides are used almost exclusively on tire boring, driving-box bearings, turret-lathe work and vertical-turret-lathe work.

Question No. 3—Replies to this question indicated that practically all substitutions have been in the nature of tool steels of low tungsten content replacing those of higher content such as a tungsten molybdenum high-speed steel with approximately five per cent tungsten in place of the 18-4-1 type. It is interesting, however, to note the fact that some shops report the substitution of carbides for high-speed steel.

Question No. 4—All replies indicated a general satisfaction with the performance of substitute steels and in some cases the substitutes have proved to be even better than the cutting tools formerly used. A shop which has installed special equipment for grinding carbide tools reports such satisfaction with present performance of carbide tools that a return to the use of high-speed tools is doubtful. Many replies stressed the importance of modern tool heat-treating equipment and the efforts now being made to obtain such equipment. The many references to the proper grinding of tools and the proper equipment with which to do it indicate that the campaigns of recent years on the part of manufacturers of tool steels to promote the idea of proper tool grinding are now bearing fruit in the form of better machine and tool performance.

How One Shop Meets the Situation

The reply from one shop superintendent summarizes the situation with respect to tool steel so well that it is quoted, in part, as follows:

"Now that high-speed steel is practically unobtainable for railroad shops, it is both surprising and gratifying to note how quickly our shop forces are adapting themselves to the new conditions, making the most of the existing stocks of high-speed steel and the substitutes which are available. Up to a year ago, solid tools, worn-out cutters, dies and reamers, etc. could be found around all machines and in tool boxes; now anything larger than vest pocket size is taboo.

"The life of cutting tools is being multiplied several times by the development of cements and fluxes for the cementing of high-speed tips onto carbon steel shanks, with proper care there being no excuse for scrapping any piece weighing more than a few ounces. Most all shops have had experience in cementing tool bits for lighter work, but it is only recently that this practice has been developed satisfactorily for heavy-duty tools. For example, it is not so long ago that solid high-speed tools 3½ in. by 1½ in. by 18 in. long were considered necessary to turn tires—now we are using a piece 1½ in. round by 1 in. thick, weighing only a few ounces, cemented on to a forged tire-steel shank, with excellent results. Experience has taught that forged tire steel of any size makes an ideal tool shank, as a separation is liable to occur between the bit and shank on the heavier cuts if a softer steel is used.

"If properly heat-treated, there is no reason to make any change in the feeds, speeds and depth of cuts from what were previously used with the solid tools; also, the tips can be ground down almost to the shanks before failure occurs. Another advantage is that there is no wear-out at all to the shank. Tool bits of standard sizes can be forged and kept in stock ready for application and can be put back in service just as quickly as by reforging a solid tool.

"We are not forgetting the fact that if the emergency exists for some considerable time, even by these methods of using up every ounce of steel available, there is going to be a time when these stocks are going to be depleted. Considerable experimenting is being done with molybdnum steels in order not to be caught short. On light work, such as turning and boring steel pins and bushings, there are no complaints with molybdenum, but on heavy or intermittent cuts, especially on cast steel where sand is encountered, we have not been so successful. Our experiences along this line, however have been limited.

"To date we have had no difficulty in procuring carbide tool bits and since they have been in constant use for several years in the local shops, our foremen and men are fairly well trained in adapting the various grades to suit the conditions.

"It has been found that while the manufacturer's manual usually gives the grade to be used in cutting different metals, to get the best results there are other conditions to be considered, such as the condition of the machine. For instance, a hard grade bit might be satisfactory on one machine and would break down on another machine cutting the same metal. Frequently carbide tools have been condemned because sufficient thought has not been given to the machine condition in selecting the grade.

"Proper grinding of tool bits to suit the metal to be cut is important; on intermittent cuts, entirely different top rakes and side angles are required to take the shock away from the point of tool. There is an article entitled "Using Carbide Tools On Large Machine" in the August, 1942, issue of the *Railway Mechanical Engineer*, page 357, by Fred. W. Lucht which covers this subject thoroughly.

"In the past the cost of carbide tools was almost prohibitive, but now that the price is considerably lower and high-speed steel is unobtainable, there is no doubt

that the use of carbides as a substitute will be increased. Briefly, our present practice is as follows:

"*First*—Collect all solid pieces of high-speed steel and forge into tool bits. Results: No loss in cutting time.

"*Second*—Use carbide tool bits wherever machine and work conditions will permit. Results: Cutting time frequently decreased.

"*Third*—Molybdenum steels have been found quite satisfactory on light work, using the same speeds, feeds and depth of cut, but our experience is limited on heavier work."

Centralized Tool Control System Needed

The present situation with respect to cutting tools is serving to show the importance of a centralized tool control method for a shop, or a railroad system. The very shortage of high-production cutting tools has increased their value to a point where every effort is being made to conserve them; to use them properly and to get from them the full measure of their capacity to cut metal. Scarcity has made obvious the fact that certain practices, indulged in when materials were plentiful, can no longer be tolerated.

Among the facts that experience of the past year has developed are: (1) That cutting tools, regardless of type can do a better job of producing if they are properly designed, properly heat treated and properly ground; (2) that the wider experience of tool steel manufacturers qualifies them to make recommendations which the railroads, as users, can well afford to follow in the effort to conserve these vital materials; (3) that it is not possible to furnish machine operators with tools of maximum efficiency unless the tool room is adequately equipped with heat-treating and tool-grinding equipment at least as modern as the tools which are now being used, and (4) that every effort should be made to secure such equipment as a guarantee that production will not be curtailed because of a bottleneck in the tool room.

The report was submitted by a committee composed of E. A. Greame, (chairman), tool foreman, Delaware, Lackawanna & Western, Scranton, Pa.; W. W. Brown, shop supervisor, Boston & Maine, N. Billerica, Mass.; W. Hurst, supervisor shop machinery and tools, New York, New Haven & Hartford, Readville, Mass.; E. J. Kueck, mechanical engineer, St. Louis Southwestern, Pine Bluff, Ark.; F. Perkins, shop superintendent, Grand Trunk Western, Battle Creek, Mich., J. I. Stewart, supervisor shop machinery and tools, New York Central, New York, and J. P. Christiansen, Chicago, Indianapolis & Louisville, Lafayette, Ind.

Finding and Training Good Supervisors

Potential supervisors are usually found in the ranks but it requires a carefully planned training program to develop them

F. K. Mitchell, Chairman

The committee, selected to prepare this report, has considered that its obligation to produce a worth while work is accentuated by the acute need arising through the present war emergency. It felt that while the subject has always been pertinent, the load on industry and railroads alike, placed there by the demands for production and transportation incident to the war effort, will only be met as successfully as is the supervisory personnel problem. With that obligation assumed, it herewith proceeds to present for your consideration the best plan and procedure its members are capable of formulating.

Basically, the first element of the problem is raised in the question—"What kind of material must be obtained, what qualifications must be present in the candidate for a supervisory position?"

Personality the Vital Factor

Contrary to the usually accepted premise, the committee feels that the first necessary attributes are found in the realm of that almost indefinable qualification called "personality." We hold that above all, in the selection of a candidate for a supervisory position, such a one as will not only be successful in handling a minor job, but as may also be depended on to be equally successful in the discharge of duties through a range of successively more important positions, should be appointed, and that no candidate without personality can be expected to fill that requirement. We shall not attempt fully to define this so-called "personality," but only to give you those components which in our opinion constitute its most important elements. These we have designated in what we believe to be the order of their importance from the point of view of this discussion. They are, first, honesty and sincerity; second, the ability of the candidate to get along with his fellowmen; third, appearance; fourth, address; fifth, alertness and enthusiasm; and sixth, initiative.

The next group of qualifying attributes in order of importance might be classed under the general heading of "background," or those good indications out of the past that may well point toward the possibility of equally good or better things in the future. Realizing full well that many a fine character has come from a family of ne'er-do-wells, we still feel that the best selection in the long run will be that of one who comes from a good substantial family. Following almost the same line of logic and experience, one with at least some religious conviction might well be chosen. Now, more than ever in the past, we feel that at least a high school education is essential. Further, it is desirable that our future

supervisor should have evidenced a keen interest in diverse affairs and even more desirable that he have evidenced some tendency to leadership in one or more fields, be it social, religious, athletic or civic.

The man we are looking for must be valuable over a long period of years, and to be so he must have good health and physical stamina. We expect to invest a great deal in him, and it is logical that if we expect to profit through such investment, he should have those attributes. Since he will be called upon to use his eyes a great deal, it is not too much to demand that they should test at least 20/20 without glasses. He should have no objectionable deformities or any hereditary or communicable diseases and his general health should be good. It might even be well for him to be moderately participant in some athletic activity.

Since the man we are looking for is to serve as a mechanical department supervisor, he should have a natural liking for things mechanical. It is essential that he be fairly good in mathematics, for his every day problems will involve their use. It is also desirable that he be mechanically analytical, and likewise mechanically creative.

Where Shall We Look For Supervisors

Having reached some definite conclusions as to the kind of material we are looking for, it will not be amiss to consider where we are apt to find it. Generally speaking, it is going to come from one of two sources. The first, and most desirable source, from many points of view, is within the ranks of our own organizations. If it can be found there, the esprit de corps of any organization will be benefited. It may come from the ranks of mechanics already employed as such, from among the regular apprentice group, or from the special apprentice group where technically trained men are afforded such special training. If not found at all in these groups, then we must look outside our own organizations, to high schools, trade schools, co-operative schools, colleges and in exceptional cases to outside industries.

The next phase of our problem is the procurement of the kind of material we know we want from the sources available. Here again two distinct problems are presented. First, let us consider the procurement from among our own ranks.

The Importance of Personnel Records

Essentially, adequate personnel records must be maintained. Often the material we are seeking is buried just under our noses. A parallel might be drawn from the experience of one railroad when the supply of scrap iron and steel became inadequate. One official remembered that an old site where a car shop had been operated for years and then abandoned, had been filled in without any attempt to remove the old rail and other scrap. They ploughed up the site at his suggestion and tons of scrap were brought to light. Adequate personnel records will perpetually turn up the much needed supervisory material which might otherwise become buried in any organization.

Secondary to such records in value to our problem comes the supervisor who knows intimately the men who work for him and their qualifications and possibilities. Such a supervisor can be of untold value in keeping management advised as to the potential supervisors in the ranks. In order to make all supervisors equally valuable, it is suggested that each and every supervisor be required to recommend to his immediate superior at least two men in his gang or department who are qualified to act in his stead or succeed him in event his position becomes vacant through promotion or otherwise. One means of making such selections less difficult is to make the supervisor s job attractive to others. To this end, the establishment of proper rates of pay and spread of rates should be under constant consideration. Another method is to accord the supervisor proper deference and prestige. A third is to design apprentice courses so that every apprentice will be inspired to desire more than a mechanic's job.

The problem of procurement of supervisory material from outside sources has a large element of salesmanship involved in it. Your company must be sold to those agencies from which the procurement can be made and to those candidates brought to your attention by such agencies. This may be done in a number of ways. Apprentice instructors and shop superintendents should keep in close contact with local high school and college personnel officers. Furnish them with information concerning your training courses and chances of advacement. Through them contacts may be made with students having the proper qualifications.

It is suggested that such methods as the encouragement of inspection trips by students of local schools through company shops in order to instill interest might well be productive of favorable results. Through interviews, by properly qualified officers with prospective apprentices while they are yet in school, both parties will benefit. If such interviews are properly conducted—not merely made a quiz—the student will learn better whether he is fitted for the kind of work being offered and the interviewer will have a chance to find out whether the candidate can qualify. Carry the procurement to the candidate, don't wait for him to come to you! In this day and age if you wait, the other company will get the best and you will get what is left. This principle will apply equally as well where the rules require sons of employees to be given preference.

Some thought should be given here as to how extensive procurement effort should be. The endeavor to locate satisfactory supervisory material among the ranks of your existing employees should, of course, be diligent and unceasing. The effort to secure it from outside sources should be gauged by your success within your own organizations. Procurement from outside sources should only be in numbers necessary to augment the deficiency from within. At all times the proper balance between technical and non-technical graduates should be maintained.

Training of Supervisors

Assuming that we are able to procure from the available sources potential supervisors in required numbers, the next step is, of course, properly to train them for positions of responsibility. This problem logically divides itself into two phases—the development of supervisory ability before and after the initial appointment.

It has been aptly said that "as a twig is bent, so the tree is inclined." The same applies to the development of a supervisor. The initial stages of his service with your company, which usually will be during his apprenticeship, may well be considered as all-important. Hence, too much thought and effort cannot be directed toward developing an apprentice training system which will not only inspire the desire to become supervisors, but also inculcate in the apprentice those traits and ideas which are known to be essential to good supervision.

With that idea in mind we offer the following suggestions: First, that all problems put up to the apprentice both in school and in the shop be related to some phase of shop or railroad activity which he may need to know about in the future. For instance, rather than have him figure the area of a circle 11 in. in diameter let the prob-

lem be to find the cross sectional area of an axle bearing 11 in. in diameter; and in the shop, rather than have his first lesson on a shaper be to plane a piece of steel to ½ in. by 5 in. by 8 in., let him make a crosshead liner of the same dimensions, explaining to him where, how and why it is to be used. Provide lectures on shop problems and operations based on the same general idea, avoiding the abstract and emphasizing the practical. Do not restrict his advance nor the nature of his work to the average of all apprentices, but let him advance as rapidly as his capabilities will permit. Subtly, yet continually, keep each reminded of the successes of former apprentice school graduates. Reward fittingly each apprentice for his interest and progress. When he is sufficiently advanced, let him act as an assistant instructor during the school hours and in the shop assign him special work which will cause him to feel that his foreman believes him to be trustworthy.

Apprentice Clubs

No greater help in the creation of supervisory material at this stage can be devised than the apprentice club. Management should sponsor the clubs but the apprentices should be allowed to run them. By observation of how they are managed—who takes the leading parts—valuable information as to the ability as leaders which various boys possess can be obtained. It has been suggested that one logical scheme might be to suggest that the club offices be given names corresponding to railroad positions, and while a boy holds such an office he be sponsored by the shop supervisor having the same title. To maintain interest in club matters at the proper height, and, at the same time, show its appreciation of the activities, management might well sponsor such activities as club trips to other shops, model building, and so forth. Finally, management should give the apprentice club all possible publicity in local, railroad and national publications.

Extra-curricular work for apprentices should be made available. They should be encouraged to take advantage of correspondence courses and night courses offered by schools and universities in the vicinity. After-hour shop forums on vital railroad problems and operations, if wisely conducted, will likewise afford an opportunity for development of address and the ability of the apprentice to express himself clearly before others.

Consultation between the apprentice and his sponsor has been found to be of eminent value. Here both may profit. The apprentice, through this medium, has a chance to find the answers to problems which are vague to him and the sponsor has an opportunity to learn more and more about the latent abilities in the apprentice and how best they can be developed.

Two Important Suggestions

All of the above suggestions may be of little or no avail unless two very important additional things are done. The first of these is to establish, by suggestion and example, that all supervisory appointments are made on the basis of qualification and merit. The second is that an adequate system of reports and records, covering all activities and qualifications of candidates, be maintained so that no error in judgment is likely when the candidates for any position are being weighed.

Often an extended period of time may elapse between the time of an apprentice's graduation and the occurrence of a supervisory vacancy. During this period his interest and desire for a better position must be maintained. He should be encouraged to participate in safety, first aid, social club and other activities. He should be consulted by his immediate superior on any matters pertaining to his gang or department and, where possible, his ideas used and he be given credit for them. As the occasion arises, he should be given an opportunity to fill in on temporary minor supervisory vacancies and an accurate record kept as to how he conducts himself.

Proper Procedure in Making Appointments

The committee does not feel that the question of the actual mechanics of appointment of the supervisor is essentially a part of its problem but would, however, like to suggest that in all cases the original recommendation should come from the candidates' immediate supervisor, if such supervisor is known to be qualified to make the recommendation. Next, that the head of the department in which the appointment is to be made have opportunity to approve and do so only after satisfying himself that the candidate has the necessary qualifications and that his recommendation was made on that basis and under no consideration on the basis of personal friendship, relationship, religion or politics. The officer charged with final approval should not only consider the merit and qualifications of the candidate as reflected by personnel records and what personal knowledge he has of these, and on the basis of impressions obtained by interview, but should consider how the candidate's personality will fit with that of the man to be his immediate superior.

The final consideration, and by no means that of least importance, which we wish to deal with, is the development of the supervisor after his appointment as such.

Our first thought here is really tied up with the actual appointment, and that is the important fact that any supervisor should be appointed only to a job which is within his capabilities of handling. Many a fine prospect has been ruined by failure to consider that too great a step forward may break the spirit of some candidates by imposing more of a load than they are yet ready to carry, and in other cases may cause the candidates to get an exaggerated opinion of themselves. Either situation is highly undesirable.

Coaching New Supervisors

Our next thought is that it should be recognized that he will need help. To this end we urge that he be given a complete understanding of his new duties and responsibilities. This may be done by conference with his new superior, but perhaps can best be done by leaving the man he is to relieve with him a few days so that the one can pass on to the other the benefit of each man he is to supervise. The new supervisor should also be given such literature as is pertinent to his job, such as shop schedules, working agreements, etc.

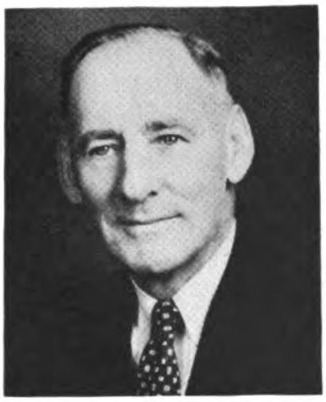
Our next thought is that the probable route of each supervisor's advancement should be pointed out to him in order that he may have opportunity to prepare himself. Urge that he do so through observation of others and study. Many roads are finding that help in this direction, by making available to all foremanship conferences and refresher courses, is highly beneficial. These are also found beneficial to management because of the opportunity they afford for observation of those who take advantage of them by senior supervisors who are constantly alert to spot such men as merit further advancement.

Here it might be well to offer an admonition against a practice which has often been followed more through shortsightedness and selfishness than for any other reason. It is—don't hold a supervisor, who is qualified for more highly responsible positions, on a job just because he is exceptionally valuable on that job. A diversity of experience will not only keep up his interest, hearten

(Continued on page 494)

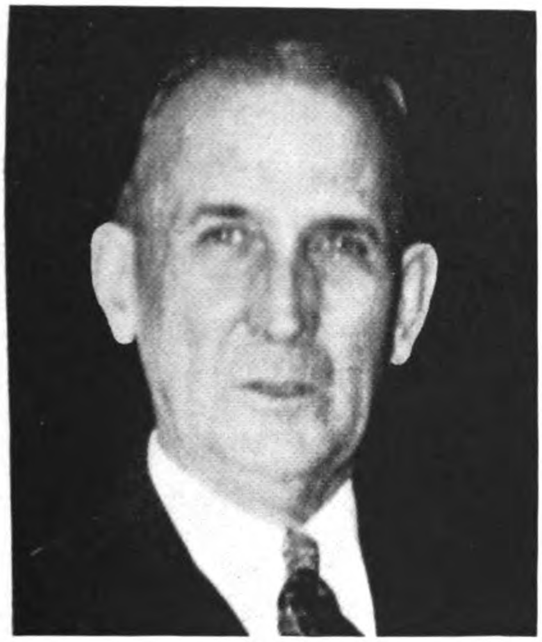
Railway Fuel and Traveling Engineers' Association

E. E. Ramey,
Vice-President



W. C. Shove,
Vice-President

T. Duff Smith,
Secretary-Treasurer



L. E. Dix,
President

Despite war-time difficulties this association presents a full complement of committee reports covering the entire range of its field—Reports deal with Diesel and steam locomotive performance, fuel, and motive-power utilization—President emphasizes demand for higher performance records

Notwithstanding the conditions which led to canceling the meetings of all of the coordinated associations which are accustomed to hold their meetings during the Fall at the same time and place and the difficulties in the way of holding committee meetings, the Railway Fuel and Traveling Engineers' Association has carried out practically a full program of committee reports, all of which will be published in the usual volume of proceedings by the association.

Reports were prepared on nine subjects which deal with air brakes, the handling of Diesel locomotives, steam locomotive firing practice, coal sizes, fuel records, fuel economy, and motive-power utilization. Gas-turbine progress is also reported.

Since no meeting of the association is being held this year, there has been no election of officers. The officers elected at the meeting of the association held at Chicago September 23 and 24, 1941, will continue to serve during the coming year. They are President: L. E. Dix, fuel supervisor, T. & P., Dallas, Tex.; vice-presidents:

E. E. Ramey, fuel engineer, B. & O., Baltimore, Md.; W. C. Shove, general road foreman of engines, N. Y. N. H. & H., New Haven, Conn.; secretary-treasurer: T. Duff Smith. The members of the Executive Committee are E. Holmquist, master mechanic, C. & N. W., Chicago; A. G. Hoppe, assistant mechanical engineer, C. M. St. P. & P., Milwaukee, Wis.; H. W. Sefton, superintendent locomotive and fuel performance, Cleveland, Cincinnati, Chicago & St. Louis, Indianapolis, Ind., and W. R. Sugg,* superintendent of fuel conservation and lubrication, Missouri Pacific, St. Louis, Mo.

Abstracts of the committee reports which will appear in the 1942 proceedings of the association are given below. These are preceded with a brief message from the president of the association pointing out the need for continued exertion.

President Dix Addresses the Members

He emphasizes particularly the fact that those who remain on the railroads have got to establish new performance records

Since our last convention war has been declared. Our first endeavor is to win this war. The members of this association play a most important part in the operation of our trains in a safe and economical manner. The railroads are doing a wonderful job, exceeding all expectations; the handling of war time freight and passenger traffic without congestion speaks for itself.

In every minute of the year 1941, the railroads moved an average of 904,000 tons of revenue freight one mile, the greatest volume ever handled in any corresponding period, by any transportation agency in the world; an average of 915 tons of freight was carried per train in 1941, the highest on record and an increase of 41 per cent compared with 1921.

You members of this organization who operate the locomotives, and you who supervise their operation, helped make that possible; and in the successful operation of our engines the fuel performance has not been overlooked; in 1941 records indicate, for each pound of fuel used in road freight service the railroads hauled nine tons of freight and equipment one mile, an increase of 46 per cent as compared with twenty years ago.

How has this record been attained? We say by the study and diligent work of the members of this association in past years. The papers read at our conventions and the discussions by the members have been very helpful in increasing the efficiency of locomotive operation with resultant fuel saving.

Many of the members of this association have been called into the armed forces of our country and many more will be called at some future date. Those of us who remain will be called upon by the railroads to improve upon the records that have been made. This will require hard work for long hours to do the things we should and will do to keep these railroads operating safely and economically.

Many new men have been employed on our locomotives and we must not make the mistake of forgetting that we, ourselves, were once student firemen or newly promoted enginemen. We must have patience with these new men, see that they are properly instructed in their work, impressing upon them thoughts of fuel economy and successful locomotive operation. These are the men who will, some day, take over our activities and duties in this organization.

Some of our railroads will, undoubtedly, be called upon to burn inferior grades of fuel, as in the last war—the railroads burning the slack, and the better grades going to the war effort; but through this association we have learned to handle and burn slack coal successfully and economically. But whatever our fuel problems of the future may be the papers which have been read and discussed at our meetings and those appearing in this volume will be helpful, indeed, to all of us.

It is, of course, to be regretted that we were unable to hold a convention this year, but perhaps a meeting can be arranged for 1943. Let us all hope this may be arranged as through these meetings much good has been conveyed to our individual railroads and more efficient locomotive and fuel performance have resulted from putting into practice the ideas and methods presented on the convention floor and discussed by the members.

Handling Diesel-Electric Freight Trains

The importance of care in starting and controlling slack emphasized—Brake applications should not be hurried

The freight Diesel locomotive is equipped with the well known Westinghouse No. 8-ET equipment having the KS-8-PA train-control brake valve with the double rotary valve and two cut-off valves, also a valve structure attached to the upper end of the brake valve pedestal, in which are located the application valve which functions to apply the brake pneumatically. A suppression valve is used to afford suppression of a pneumatic brake application for a predetermined time, if less than a full service manual brake application is made; a reduction-insuring valve functions to position the reduction suppression valve to permanently suppress a pneumatic brake application when a manual service brake pipe pressure reduction of 20 lb. or more is made. A recapture valve provides a "split reduction" of brake-pipe pressure during a pneumatic brake application by use of the first service position of the automatic brake valve. Operating in conjunction with this equipment is an electric pneumatic timing valve, several small volume reservoirs, etc. The equipment mentioned above used with the No. 8-ET equipment is to adapt the function-

* Mr. Sugg is now general supervisor of air brakes at St. Louis, Mo.

ing of the speed and safety control features used with the freight Diesel locomotive, and affects train handling only when permitted to operate pneumatically.

The 5,400 hp. Diesel-electric locomotives will handle a train of 150 cars, approximately 7,500 tons, where the grades, both ascending and descending, do not exceed 0.5 per cent, at speeds up to 50 and 60 m. p. h.

Starting Long Trains

It is important that the slack be controlled when starting, as well as when stopping. Changing slack, if not done properly, will result in damage to the lading and drawbars. It requires more time to release the brakes on a long freight train; therefore, ample time must be allowed for all brakes to release before attempting to start. After the brakes have released, the Diesel locomotive throttle should be placed in run (1) and allowed to remain in this position as long as the locomotive is moving and until it is known that the entire train is in motion. If the train cannot be started with the throttle in run (1) after waiting some 5 to 10 seconds the throttle should be advanced to run (2) and, after waiting 15 to 20 seconds, if the train does not start, move the throttle to run (3). The locomotive should start the train in run (3) even though it be a tonnage train and on ascending grades; however, if it will not start in run (3) after allowing ample time for full power development the throttle may be moved to run (4). Care must be exercised with the throttle in run (4) as the locomotive will develop sufficient power to break the train in two. Slacking should be avoided if possible; however, it is much better to take the slack than it is to build up excessive power endeavoring to start a train that has the slack stretched tight.

Often a train cannot be started with the throttle in run (4) and when the slack has been taken on the entire train it can be started with the locomotive throttle in run (2). If the slack has been taken on the train on grades where it is possible for a roll back, it must be known that the entire train is at rest before power is again used. Then use power moderately until all slack has been taken up and the train set in motion. After the train has been set in motion care must be exercised in advancing the throttle, as there are two conditions that become manifest when attempting to accelerate too rapidly with the Diesel locomotive: First, there is a liability of overloading the generator. Second, severe strain is placed on the draft gear in the head portion of the train. The throttle should not be advanced until the Diesel engines have responded to the throttle setting.

Our committee has admonished against too rapid advancement of the Diesel locomotive throttle when starting a long train, and we repeat with emphasis, all that has been said in this connection; however, when handling the locomotive without cars, or while switching, such as picking-up or setting-out where only a few cars are being handled, more rapid advancement of the throttle is recommended. Under these conditions, two or three seconds is ample time to remain in the different throttle positions.

Not advancing the throttle properly causes delays to important shipments, keeps the locomotive on the road longer and thereby reduces its earning power. It is also reacting very unfavorably for this type of power.

Relation of the Throttle to Brake Applications

When the train brakes are to be used in controlling the train speed, or where a stop is to be made, and the locomotive throttle is then in any position above run (5), the throttle should be placed in run (5) sufficiently in advance of the brake application to permit the locomotive to again develop the maximum power output of run (5) and the train slack to readjust from the reaction of the throttle change before the brake application is started. First service position of the brake valve should be used for the initial reduction after which the brake valve may be placed in lap position. The locomotive brake should not be permitted to apply during the brake application. If the train is to be stopped, the brake application should be started sufficiently in advance of the objective that the initial reduction, plus the leakage, will develop the desired brake cylinder pressure. The locomotive throttle should be reduced as the speed reduces, placing the throttle in idle position and start a final reduction by using regular service position of the brake valve, about forty feet in advance of the stopping point. The locomotive brake should be applied during the final reduction and the rail sanded. Judgment must be exercised in making the final reduction. If made too early the brake application will become effective on the cars near the rear of the train and thereby defeat the object of the final reduction.

If, while making the stop, the engineman finds he has erred in judgment and it is necessary to make the second brake pipe reduction to prevent over-running the objective he should allow twenty to twenty-five seconds time between the closing of the exhaust port from the initial reduction before starting a subsequent reduction. Subsequent reductions should be limited to less than the initial reduction and should not exceed four to five pounds at any time. After the train is at rest the brake-pipe pressure should be reduced to the point where sufficient differential of pressure can be had across the face of the triple or control the valve piston to insure moving the valve to release position before an attempt is made to release the brakes.

Running Releases

Generally speaking, your committee does not recommend making a running release of the brakes on trains consisting of 150 or more cars; however, if the speed, grade, brake application, brake-pipe leakage, and position of slack is favorable, the brakes can, and have been, released on trains of this length without any change or slack. If a running release is desired make the brake application by using first service position of the brake valve for making the initial reduction then move the brake valve to lap position, after which the brake valve may be moved between first service and lap position until the desired brake pipe reduction has been made, which should be from 12 to 15 lb. to insure the release of all the brakes on a long train. As the brake valve is moved to release position the locomotive throttle should be gradually reduced to idle position and the locomotive brakes applied moderately. Release position of the brake valve may be used to advantage in releasing the brakes on long trains. The brake valve can be left in release position fifteen seconds where a fifteen pound brake application has been made without danger of overcharging. After all brakes have released the locomotive brake may be released and when the train has passed over the restricted area the use of power should be gradual to allow for the slack to adjust in case it closed in during the release.

When operating on light descending grades at moderate speeds with long trains and the locomotive operating with the throttle in any position below run (5), and it is desired to reduce the speed to comply with further restrictions, after which a running release is to be made, it is better to advance the throttle to run (5) to assist in stretching the train before the brake application is

started. Initiate the brake application by using first service position of the brake valve then move the brake valve to lap position. After the brake application has been established, while the brake cylinder pressure is low, and before there has been a material reduction in speed, move the brake valve to running position then back to lap, releasing the brakes on a few cars on the head end.

Repeat the movement of the brake valve from lap to running position serially as the speed reduces. To compensate for the loss in retarding force (account some of the head brakes having been released) it will be necessary to increase the brake application either through leakage or by light reductions between the movements of the brake valve to running position. By increasing the retarding force on the rear end of the train and decreasing it on the head end in light graduations allows for the most favorable slack adjustments and will permit a heavier brake pipe reduction thereby creating a higher differential of pressure across the face of the triple and control valve pistons, thus, insuring the release of all brakes. As the brake valve is moved to release position, to complete the release, the locomotive throttle should be gradually reduced to idle position and the locomotive brakes applied moderately.

If, when making a running release, the speed continues to reduce, indicating the brakes are not releasing, additional retarding force should be provided such as is possible by use of the locomotive brake, and if it is evident that train is going to stop, a final reduction should be made about forty feet in advance of the stopping point.

In stopping a long train while backing with Diesel power the same procedure of handling should be followed as if using a steam locomotive, other than the throttle should be placed in idle position as the locomotive comes to rest. Conditions must govern. Ordinarily it is better to use power moderately, make a light brake application keeping the locomotive brakes released and continue to use power until just as the train comes to rest. The stop should be made with one brake pipe reduction. A final reduction should not be made when stopping any train that is being pushed by the locomotive that is controlling the brake operation.

Throttle Handling After Caboose-Valve Brake Applications

With the high capacity feed valve and large volume of main reservoir air pressure on the Diesel locomotive it is more difficult to determine when the brakes are being applied by the use of the caboose valve with the Diesel locomotive than it is with the steam locomotive. And too, the Diesel locomotive develops greater tractive force as the speed reduces, thus requiring a heavier brake application to stall the locomotive; therefore, it is important that the engineman be alert at all times, watch the speed, the power build-up, and reduce the power in ample time and as the speed reduces, place the throttle in idle position and fully apply the locomotive brake about 100 ft. before the train comes to rest. Many knuckle and drawbar failures can be prevented by the proper handling on the part of the engineman during a brake application that has been made by the use of the caboose valve. The automatic brake valve should be left in running position during the brake application.

Should an emergency application of the brakes develop during the time the brake valve is in first service position, the brake valve should be moved to lap position immediately, otherwise, the maintaining valve will be unseated and admit feed-valve air to the brake pipe which will have a tendency to "kick off" the locomotive brake, resulting in a run out of slack and the possibility of a break-in-two. In case of an emergency application of the brakes made independently of the engineman the throttle should be moved to idle position immediately and the brake valve placed in lap position. Experience has proved that it is possible to hold the head portion of the train during an undesired emergency on long trains and thereby avoid break-in-twos.

When the speed control devices function to apply the air brakes, there are certain manual operations necessary, such as moving the automatic brake-valve handle to lap position, which limits the brake-pipe pressure reduction to a full service, or split the reduction by placing the brake-valve handle in first service position. A speed-control application can be suppressed by prompt action when the timing valve whistle blast is heard; this suppression is accomplished by initiating a manual brake application within six seconds following the blast of the whistle. In the event of brake application due to the functioning of the safety control feature device caused by the intentional or unintentional removal of pressure from the foot valve pedal, this application can be limited to a full service reduction, provided the foot valve pedal is pressed to its lowest position, and the automatic brake valve handle is placed in lap position immediately following the start of the application. The fact that these applications can be limited to a full service reduction permits a running release provided the speed is sufficiently high to safely do so.

The Regenerative Brake

Further, in connection with train handling, the freight Diesel locomotive is equipped with an electric regenerative holding brake hereinafter referred to as a dynamic holding brake. The fact that this is a holding brake only, as the name implies, it is, therefore, necessary to assist in slack control and stop a train by the use of the air brakes, which requires the utmost skill.

The dynamic holding brake is designed to regulate the speed of a train on a descending grade that is equal in tonnage to a train that the locomotive can haul and successfully negotiate the same grade ascending. When descending a grade with a train consisting of more tonnage operating under conditions mentioned above, on grades where the distance is greater between curves, and in the absence of other easements it is necessary to resort to the use of the air brakes in addition to the dynamic holding brake; in this event the train air brakes are applied with a 10- to 12-lb. reduction and the locomotive air brake is not permitted to apply. Should the train speed reduce to the limits in which the dynamic holding brakes loses its effectiveness, (these speed limits are covered by special instruction), the locomotive air brake must be fully applied in time to compensate for the loss of resistance, due to the dynamic holding brake losing its effectiveness, this to prevent a forward surge of the locomotive at the instant the locomotive is no longer influenced by the regenerative resistance of the dynamic holding brake.

Long trains can be handled just as efficiently and expeditiously with the Diesel locomotive as they can be with the steam locomotive if proper judgment is exercised. Time and intial reductions are very important factors if slack action is to be prevented and controlled. Ample time must be allowed during brake application and the initial reduction limited to not over 5 to 7 lb.

The report was signed by J. B. White, assistant supervisor of air brakes, A .T. & S. F.; P. A. Quarles, assistant supervisor of air brakes, A. T. & S. F.; and E. F. Barsh, assistant supervisor of air brakes, A. T. & S. F.

The "Combustion Train" of the Steam Locomotive

The former Committee on Front Ends, Grates, and Ash Pans adds arches to complete the train of appliances affecting combustion

J. R. Jackson,
Chairman

By reason of the press of regular duties, occasioned by the increasing business resulting from the national emergency, the Committee on Front Ends, Grates, Arches, and Ash Pans has not been able to hold a meeting this year. A list of questions was sent by the chairman to each member on February 3 with the request that replies be sent in on or about May 1 so that there would be as complete and independent an exchange of thought on the subject assigned to the committee as possible.

The returns to the list of questions were very incomplete and did not, therefore, give the cross section of current thought that was anticipated. However, the list of questions circularized and the replies made thereto by the chairman are herewith given with the thought that this material may be of some value in continuing interest among the members in this all-important subject.

[There were 12 questions and answers in the report. The first four are omitted in the following abstract.—Editor.]

(5) *Q.—Should, or should not, locomotives using different grades of fuels be drafted for best all-around fuel economy, free steaming and minimum on-line and terminal attention to the essential appurtenances involved (front-end, flues, arch, grates, pans)?*

A.—Yes. There has to be a certain degree of flexibility or adjustability to the combustion train in a steam locomotive to permit of "drafting" for the character or preparation of the fuel available; there is no such thing as a standardized combustion train (front-end, flues, grate, arch, pan) to make a locomotive universally available to burn economically all grades of fuel—even solid fuels on grates.

(6) *Q.—As applying to the commonly used term "drafting a steam locomotive." (a) Give your definition. (b) What factors are involved? (c) How accomplished to give best results?*

A.—The term "drafting a steam locomotive," in the broad sense, is the adjustment of the combustion train (front end, grates, arch, pan) to regulate the flow of air through the fire-bed to effect combustion and to direct the flow of the heated gases from above the fire, through the firebox and flues, to convert the heat energy liberated through the combustion process into steam. This is accomplished through the regulation of the volumetric flow of the gases by controlling resistances in the paths of flow. "Drafting" also usually includes control of the fire hazard and provision of a self-cleaning front end.

A locomotive has certain "fixed resistances" built into it which cannot be changed in the ordinary process of drafting the locomotive. These are size and setting of stack, height of nozzle stand, front-end dead plates and netting, flues and tubes, firebox, grate area and air opening, pan air opening. There are other "adjustable resistances," the principal ones being front-end plates and arch setting. Other things remaining the same, "draft" is proportional to nozzle-tip area, consequently:

(a) A locomotive is usually drafted by adjusting the size of the exhaust-nozzle tip to provide adequate draft for burning the grade of fuel supplied.

(b) Adjustment of nozzle area, draft plate and arch setting are about all that can ordinarily be done to "draft a steam locomotive" by shop and road forces.

(c) Drafting a steam locomotive in the larger sense should start at the drawing board when the locomotive is designed, the designer giving consideration to the best proportion and arrangement of the essential parts of the entire combustion train (front-end, flues, arch, firebox, grates and pan).

(7) *Q.—What size or grading of bituminous coal is best adapted to all-around locomotive use? Is there any limit as to sizes, particularly smaller sizes or "fines" which can be economically burned on grates? If so, what are these limits?*

A.—With locomotives drafted for a 2-in. screening preparation, this grade of bituminous coal from a given source is the best for all-around locomotive use. The limit to the smaller sizes of coal which can be economically burned on grates is the natural impurities in the small sized available coal or their preparation by washing, etc. to reduce the impurities in the small sizes. So long as it is coal and not *dirt*, small sized coals can be economically burned on grates as long as the drafting of the locomotive to burn the smaller sizes includes the grates and arch as well as the front-end.

(8) *Q.—How should a locomotive be drafted to small size bituminous coal on grates most economically burn?*

A.—Ample areas of stack and nozzle, restricted air-opening and properly fitted grates and a sealed arch.

(9) *Q.—Are you familiar with the "Master Mechanics' Locomotive Front-End Arrangement" and with the data and design instructions relating thereto as shown in Section F of the A.A.R. Manual, Pages F-211 to 231-1937? To what extent are these design data being used on the railroad with which you are connected.*

A.—The A.A.R. front-end design details and formulæ are not followed to any extent on the Missouri Pacific.

(10) *Q.—Are you familiar with the University of Illinois studies of the locomotive front-end by means of tests on a front-end model, Bulletin No. 256 (May, 1933) and Supplement No. 274 (May, 1935), also Fuel Association Annual Report 1933? To what extent has the information made available by research been used on the railroad with which you are connected?*

A.—The basic information contained in U. of I. studies has not been given the consideration it should by the railroads. This is true of the Missouri Pacific. We are now arranging to apply an experimental front-end arrangement patterned largely after the U. of I. general recommendations and hope to develop worth-while information when circumstances permit.

(11) *Q.—What devices, design changes, or practices having to do with the combustion of fuel, which have come into general practice during the past ten years, have resulted in the greatest improvement in the overall cost of evaporating water into steam (a) for coal-burning locomotives and (b) for oil-burning locomotives?*

A.—There were three answers to this question. The chairman and W. E. Small, B. & M., cited restricted air openings in the grates and closer attention to the fitting up and maintenance of grates. H. E. Green, Nor. Pac., listed the following appliances: brick arches, superheaters, feedwater heaters, exhaust-steam injectors, Thermic syphons, air-operating fire doors, flue blowers, circulators, and feedwater treatment. Applying specifically to (b) the chairman cited heating facilities for handling and firing the heavier grades of residuums.

(12) *Q.—Where lies the greatest possibility for further improvement in the economical burning of fuel in the steam locomotive which may be released during the next decade through improvement in functioning or maintenance of any of the component parts or better correlation of appurtenances covered by the committee (a) for coal-burning locomotives and (b) for oil-burning locomotives?*

A.—Four members of the committee commented on the subject of this question. Three (J. R. Jackson, Mo. Pac.; H. E. Green, Nor. Pac.; and W. E. Small, B. & M.) gave correlation of the essential parts of the combustion train as the answer; two (Messrs. Jackson and Small) referred specifically to the possibilities of the development of nettingless front ends; the third (Mr. Green) added improvements in the steam-distribution system and treatment of boiler feedwater. The fourth member of the committee (E. G. Young, University of Illinois) believed that "the ultimate in locomotive fuel economy will be obtained when a CO_2 recorder can be installed as one of the back-head instruments, accompanied by a by-pass to exhaust some of the steam directly to the open air, with enginemen trained to adjust the flow through that by-pass in order to get the largest amount of CO_2 in the flue gases."

The report was signed by J. R. Jackson (chairman), engineer of tests, Mo. Pac., St. Louis, Mo.; B. C. Bertram, railroad salvage director, Bureau of Industrial Conservation, WPB, Washington, D. C.; H. E. Green, fuel supervisor, Nor. Pac., St. Paul, Minn.; H. L. Malette, road foreman equipment, St. L.-S.F., Springfield, Mo.; W. E. Small, chief fuel supervisor, B. & M., Boston, Mass.; S. R. Tilbury, fuel supervisor, A. T. & S. F., Topeka, Kans.; L. W. Withrow, M. A. O. inspector, C. & O., Clifton Forge, Va.; and E. G. Young, University of Illinois, Urbana, Ill.

Firing Practice on Coal-Burning Locomotives

Get the fire started right, then watch it closely—The stoker will do only what the fireman makes it do

W. C. Shove,
Chairman

On stoker-fired engines with interior of cab design which will permit the use of shovel, it is suggested building up fires at initial starting points, and firing of locomotive around yard before trip is started, be done with the shovel because in a number of cases small banks and clinkers were started at terminals which later caused trouble on the road. This practice is recommended at starting points only where a new green fire is involved because after the fire has a bright bed and the brick arch is warmed up, there does not seem to be nearly as much liability of doing damage to the fire as there is before.

In a number of cases bad fires are started leaving terminals by crowding the fire before the arch is heated to a point where perfect combustion will take place. As a possible remedy for this it is recommended that where boiler and water conditions permit, an effort be made to start on the run with enough water in the boiler to permit the loss of drop in boiler water for a few minutes or a few miles, until the arch has heated up, and thus relieve the inclination on the part of the fireman to crowd the firebox with coal when it is not being properly burned in an effort to maintain maximum steam pressure.

Whatever water level is carried, it should be maintained with an even, steady flow, refraining from flooding the boiler at one time and shutting off at another. This will prevent damage to boiler and firebox sheets by rapidly changing temperature and the waste of fuel that is ever apparent with improper handling of the feedwater supply to the boiler.

The Stoker No Substitute for a Fireman

After the train is out of the terminal and well under way, the fire should be watched closely and, if necessary, the stoker should be stopped as sometimes it is very difficult to see fire with stoker in operation. Firemen should never be allowed to think other than that the mechanical stoker is only a machine that was designed to place an even layer of fuel over the fire bed, and will only do what we make it do. The stoker does not know what portion of the firebox is using the greatest amount of fuel, neither does it know where a bank has been started, and it is always necessary for a fireman to keep almost constant watch of the fire at all times.

Firemen should be instructed to watch the steam pressure necessary to run the stoker at an even speed that will just supply the need for fuel and avoid the continual racing and shutting off of stokers, which usually

results in heavy banked fires and excessive smoking.

Firemen should watch the smoke stack. Considerable good information is obtained by noting the color of smoke or exhaust coming from the stack. Where it is possible to maintain steam pressure with a perfectly clear stack, it is in line with good handling occasionally to make several quick turns of the stoker, and if stack can be momentarily clouded it is a good indication that the jets are properly set and that the stoker is distributing an even supply of fuel over the entire grate area.

In some cases where fires were banked, possibly by poor handling of stoker, the fireman shakes the entire bank into the ash pan, which results in waste of fuel and delay while dumping ash pans.

The proper shaking of grates is an important factor in connection with good firing practice. Grates should be shaken often enough to keep dead ashes off the grates when the fire becomes so heavy that it restricts the free flow of air to the firebox. No standard can be set up that will apply to all roads under all conditions as to how often and how hard grates should be shaken. This will depend on the quality of coal, the type of grates and the quantity of coal fired in a given period.

Firing locomotives on drifting movements requires considerable good judgment and experience to maintain steam pressure and avoid trailing black smoke, especially in cases where drifting throttles are used to excess or where too much steam is admitted to the cylinders. On drifting movements, when operating and engine conditions permit, side sheets should be fired alternately and no fuel placed over the entire grate area at the same time.

On free steaming stoker fired engines it is the tendency of some enginemen to work the engine at too long a cut-off, with little regard for the amount of back pressure used and the harmful, wasteful results. A partial remedy for this bad practice is to equip large locomotives with a back-pressure gauge, with instructions issued as to the maximum amount of back pressure permitted on the different classes of engines.

Don't Abuse the Blower

To furnish steam for the locomotive blower at full capacity, consumes fuel at the rate of approximately 600 lb. of coal per hour. This will serve to indicate the extent of waste possible through abuse of the blower. In the interest of economy, do not apply the blower except when necessary and then as lightly as conditions require.

Good team work among all departments and classes of employes on a railroad is always very essential to successful operation and one of the most important places where good team work will have the desired effect is on the locomotive. Its appurtenances function properly only when they are all handled correctly by the engineer and fireman working together.

The report was signed by W. C. Shove, chairman, general road foreman of engines, N. Y., N. H. & H.

Firing Practice on Oil-Burning Locomotives

This report emphasizes that the economy attained in fuel consumption depends largely on the performance of the engineman

R. W. Hunt, Chairman

Previous reports of the committee have covered the duties of a fireman from the time he got on the locomotive to start the trip until he was at the end of the run.

Too little attention has been given to water supply or pumping the boiler, and it is assumed on greater number of roads that this is the fireman's duty. Larger power with boilers of greater capacity and higher pressures have made necessary a near approach to the use of the water feeding appliance at the rate steam is taken from the boiler. This, if practiced, gives most economical conditions as to feed-water temperatures, uniform water level, higher super-heat temperatures, and reduced strains on various stressed portions.

The Engineman's Part in Firing Practice

In bad water territory, the fireman will watch you if you blow out a little water and he will perhaps do the same. This procedure with the blow-off cocks before starting and a little understanding how you will work the injectors or water pump and the water level, will give you a good start. A fireman familiar with your ways of operation and the grades on the division will need no coaching.

Though the engineman is working the engine to what he thinks is capacity he may find that the water level is getting lower. Naturally, he will question if pump is on full open and lubricated, or injector wide open. This should suggest to him he has gone beyond the economical point with the reverse lever. It is assumed that the left side water supply appliance is of capacity adequate to develop the maximum boiler horsepower. Very few realize or recognize the fact that the second water supply unit is a reserve in event of a failure of either one. If the engineman would recognize this as much as he does the sound of the exhaust, he would do much in cooperating with the fireman.

The right side can do a lot by giving the fireman a warning in advance of his moves. Even if the fireman knows the next stop or change in the grade, different enginemen shut off at different places to stop at the same water column. If everyone is prepared to make moves in advance, they can do better.

Then, at the end of the trip when the engine is turned over to others, a word of praise or a compliment on things that were done properly. If something was done wrong, just say that next time we will try doing this

or that in some different way. An interest in the fireman's efforts to keep full steam pressure with a clear stack and ample supply of water in boiler will assure a better trip over the road next time.

The foregoing is the first observation of an engineer on an oil-burning locomotive. Under ordinary operation his urge is to get the train under way as rapidly as possible. He may not realize that the cylinders and boilers are comparative low in temperature, and water in the boiler heated only in spots and above all that there is approximately 2,700 lb. of brick in the fire box which has to be heated to 2,000 to 3,000 deg. F. before the steaming performance of the engine actually becomes efficient.

The report was signed by Roy W. Hunt (chairman), fuel supervisor, A. T. & S. F.

Can More Locomotive Hours Be Made Serviceable?

Pertinent question to which managements should seek answers—Expediting engines through terminals stressed

A. A. Raymond,
Chairman

The Committee on Utilization of Locomotives has given careful study to determine opportunities for increasing the use of locomotives. It suggests that consideration be given to preparing for handling considerably more business, and for handling the present or increased business with the most effective use of man power. It should be determined whether an analysis of present locomotive performance indicates that there is more serviceable time available for road work. More intensive use, if possible, would permit concentration of available man power and tend to reduce temporary repair types of work, besides permitting the handling of a considerable increase in business or of handling the same business with fewer locomotives. It should also be determined whether definite supervision of the use of locomotives will not pay in present or future shortages of locomotive parts and labor.

What Is Needed? Can It Be Obtained?

Prudent management is giving very careful thought to what will be necessary if, say, 25 per cent more trains are presented for handling or if a shortage of critical material makes it necessary to increase locomotive utilization 25 per cent and, with the impending labor shortage, to what can be done to utilize available labor and facilities to the greatest extent.

All roads can obtain the figures for the performance of their locomotives, that is, the average miles per day of active locomotives (all those not held at enginehouses or shops out of service for a calendar day for repairs); the per cent out of service at both shops and enginehouses will show the efficiency with which repairs are made. The Railway Age of July 4, 1942,[1] and one's general experience will indicate what is a good figure.

Having the miles per day, a close estimate can be made of the hours per day these active locomotives are working. Such a study was noted in the *Railway Mechanical Engineer*[2] where one road found engines on the road about eight hours out of every 24 and yard engines working about 11 hours out of every 24. The same thing can also be approximated from the average speed of passenger and freight trains and the established ratio of six miles per hour for yard locomotives.

A further detail study can then be made at each terminal jointly by the operating and mechanical officers who, studying each locomotive sent to the enginehouse, will answer the question "Why is it necessary to take the locomotive out of revenue service and send it to the enginehouse?" The answer may be that there is no work available for the locomotive at the particular time it arrives at the terminal; considerable ingenuity is frequently required to keep locomotives working, perhaps on connecting jobs.

Other reasons may be that the locomotive requires supplies, water, coal, fire cleaning, or periodical repairs. Taking on water and coal, and cleaning the fire might, with suitable equipment, be performed close to where the locomotive is relieved. There is considerable experience to indicate that the three jobs can be performed in about 20 min. If the need of running repairs is the reason, perhaps this work can be done at the same place. It may be possible, by concentrating a group of capable men at a point near where the locomotive is relieved, that they can handle the running repairs expeditiously and thus free the other mechanics for steady work on reconditioning jobs, each with all necessary facilities to reduce the "Walking time" and "poor tools" time to a minimum.[3]

What Some Locomotives Are Doing Others Can Do

So many road engines are working many continuous hours daily that it would seem possible to say that the machine itself is capable of providing greater service. Many yard locomotives are also working approximately two-thirds of the day.

A committee report of the American Association of Railroad Superintendents at the last meeting in Chicago

[1] See "Greater Use From Locomotives," July 4, 1942, Railway Age, page 24.

[2] See editorial "How High Is Your Score?", August, 1942, *Railway Mechanical Engineer*, page 344.

[3] See "Walking Time Can Be Reduced," April, 1942, *Railway Mechanical Engineer*, page 168.

pointed out that when running locomotives through terminals careful consideration should be given to the arrangement of tracks, fueling, watering and other service facilities to promote expeditious handling; that where operating conditions justify, runs of locomotives should be extended to increase their productive time; that special attention should be given to the possibility of reducing the running time of locomotives at terminals; that operating and mechanical officers should collaborate in closing the gap between actual and potential locomotive service.[4]

The report was signed by A. A. Raymond (chairman), superintendent fuel and locomotive performance, New York Central, Buffalo, N. Y.

Coal Equivalent of Other Fuels and Power

Attention is called to the effects of the widely varying values of equivalents on coal consumption reported

E. E. Ramey,
Chairman

In the introduction of its report the committee calls attention to the action of the association during the 1941 convention of the association when the officers and members of the Executive Committee were directed by vote from the floor to take steps to obtain, if possible, the publication of more detailed fuel statistical reports for the Class I railways than were then available for general distribution. The committee recites the action taken in bringing the matter to the attention of Dr. Julius H. Parmalee, director, Bureau of Railway Economics, A.A.R., who agreed to prepare a comparative statement of unit power and fuel consumption of locomotives by individual railroads when the final statistics for the year 1941 became available. The committee recorded the issuing of the report by the Bureau of Railway Economics on February 17, 1942, and of its subsequent publication in the Railway Age of April 18, 1942.

Coal Equivalent of Fuel Oil

The discussion of previous reports of this committee dealing with coal equivalents at present used for equating the various kinds of fuel and power have centered particularly around the question of the coal equivalents used by different roads for equating the fuel oil used in oil burning steam locomotives. It seems probable that this preponderance of interest has been based upon the fact that on 18 roads in the Western District the fuel oil used in oil burning steam locomotives ranges in amount (1941) from 2.3 per cent to 100 per cent with an average of 43.7 per cent of the total fuel reported in freight service on those roads, and the correspondingly important effect upon the unit fuel performance reported by these roads that is exercised by the equivalent values used in equating the oil to coal.

The exhibit shown in Table I sets forth some of the significant aspects of this feature as reported by these roads for the year 1941. The eighteen roads have been listed in two groups. For the eight roads included in Group I the equivalent values which are used in equating fuel oil to coal, gallons per ton, vary from 126 to 162 and average 140. The ten roads in Group II all use an equivalent value, in equating fuel oil to coal, of 168 gallons per ton.

The percentage of the gross ton mileage of each road that is made with oil-burning locomotives, Col. 1, is shown to vary from 2.7 to 75.3 with an average of 27.8 per cent for the Group I roads, while this item varies from 40.8 to 100.0 with an average of 81.4 per cent for the Group II roads.

Section 1 of the table shows for each road, and for the averages of the groups, how the equivalent coal consumption in pounds per 1,000 gross ton-miles works out for the oil-burning locomotives, Col. 5, the coal-burning locomotives, Col. 6 and all the locomotives, Col. 7, based upon the equivalent values actually used by each road in equating fuel oil to coal, Col. 3. The average oil consumption of the Group I roads in gallons per 1,000 gross ton-miles, Col. 2, is only 3.5 per cent greater than that of the Group II roads, but the averages of the equating values used makes the "pounds of coal per gallon of oil," (Col. 4) 20.2 per cent higher for the Group I roads with the result that the average "pounds of equivalent coal per 1,000 gross ton-miles" for oil-burning locomotives (Col. 5) on the Group I roads is 24.2 per cent higher than on the Group II roads.

Section 2, of Table II shows how these items would work out for each of the eighteen roads listed if each road should use the equivalent value for equating fuel oil to coal, 140 gals. per ton that is shown to be the arithmetical average of the values actually used by the Group I roads for this item (Cols. 3-4-8-9). It will be noted that under this assumption the values "for pounds of equivalent coal per 1,000 gross ton-miles" with oil-burning locomotives, (Col. 11) for each of the eighteen roads is different from that shown in Col. 5, the unit coal consumption of the coal-burning locomotives is of course unchanged (Cols. 6 and 11), the values for, "pounds of equivalent coal per 1,000 gross ton-miles" for all locomotives (Col. 12) is slightly different for all except one of the Group I roads and is from 9 per cent to 20 per cent higher for each of the roads in Group II. While the averages for the Group I roads remain unchanged since this is the base for the recalculation, the averages for the Group II roads, except for Col. 6 and 11, are from 16 to 20 per cent higher in Section 2 than in Section 1 of the table, due to the effect of the differ-

[4] See Railway Age, July 4, 1942, page 25.

ence in the equivalent value used for equating oil to coal which results in an average difference of 20 per cent in the weight of coal recorded per gallon of oil consumed.

Coal Equivalent of Electric Power

Because of the fact that there is such wide variation in the equivalent values for equating electric power to coal used by the six railroads on which electrical operation is sufficiently important to exert an appreciable effect upon the performance records in road freight service, we have prepared Table II to set forth some interesting comparisons.

The six roads have been listed in two groups. The three roads included in Group I use equivalent values in equating electric power to coal which vary from 350 to 684 kw. hrs. per ton of coal and average 470. The three roads listed in Group II use equating values which vary from 1,094 to 1,363 and average 1,265 kw. hrs. per ton of coal.

The percentage of the gross ton mileage of each road that is made with electric locomotives, Col. 1, is shown to vary from 1.4 to 8.7 with an average of 4.3 per cent for the Group I roads, while this item varies from 14.1 to 33.4 with an average of 15.5 per cent for the Group II roads. From this it follows, of course, that the choice of equivalent values for equating electric power to coal exercises a much more important influence on the final values of the fuel units reported for the Group II roads than for the Group I roads, which is clearly shown by the comparison of Columns 7 and 12.

The electric power consumed, kw. hrs. per 1,000 gross ton-miles, Col. 2, by the Group I roads averages 41.00, and by the Group II roads averages 23.80 being 72.3 per cent greater on the Group I roads where the electrified lines are principally on heavy mountain grades.

The equivalent value used for equating electric power to coal, stated as pounds of coal per kw. hr., Col. 4, by the Group I roads averages 4.25 which is 169 per cent greater than the average value of 1.58 used by the Group II roads. It is obvious that this very great difference in the equating values is principally responsible for the fact that the Group I roads report an average of 174 lbs. of equivalent coal per 1,000 gross ton-miles, made with electric locomotive, Col. 5, which is 370 per cent higher than the average of only 37 lbs. reported by the Group II roads.

Section two of Table II has been compiled in the same manner as was Section two of Table I, based upon applying to the calculation for each road the arithmetical average of the equivalent values used by the Group I

Table I—Freight Service 1941 (Gross Ton-Miles, including Locomotive and Tender)

			SECTION 1					SECTION 2				
			Equating value used, oil to coal		Equivalent coal, lb. per 1000 g. t. m.			Avg. equating value		Equivalent lb. coal per 1000 g. t. m.		
Road	Per cent of g. t. m. with oil-burning locos. (1)	Oil consumption gals. per 1000 g. t. m. (2)	Gals. per ton (3)	Lb. coal per gal. (4)	Oil-burning locos. (5)	Coal-burning locos. (6)	All locos. (7)	Gals. per ton (8)	Lb. per gal. (9)	Oil-burning locos. (10)	Coal-burning locos. (11)	All locos. (12)
Group I:												
Nor. Pac.	2.7	6.65	126	15.9	106	125	124	140	14.3	95	125	124
Gt. Nor.	47.5	6.47	127	15.7	102	91	96	140	14.3	92	91	92
C. M. St. P. & P.	4.6	9.03	128	15.6	141	109	115	140	14.3	129	109	114
C. B. & Q.	5.3	8.09	130	15.4	124	106	108	140	14.3	115	106	107
A. T. & S. F.	75.3	8.21	138	14.5	119	108	116	140	14.3	117	108	115
Un. Pac.	19.7	10.85	147	13.6	147	118	124	140	14.3	155	118	125
C. & N. W.	7.0	9.67	157	12.7	123	117	118	140	14.3	138	117	119
Mo. Pac.	13.7	7.54	162	12.3	93	117	113	140	14.3	108	117	115
Averages	27.8	8.28	140	14.3	118	113	115	140	14.3	118	113	115
Group II:												
Westn. Pac.	73.5	7.71	168	11.9	92	109	96	140	14.3	110	109	110
K. C. Sou.	69.0	8.68	168	11.9	103	135	113	140	14.3	124	135	127
M. K. & T.	99.8	7.09	168	11.9	84	274	85	140	14.3	101	274	102
Frisco	40.8	9.06	168	11.9	108	129	121	140	14.3	130	129	130
St. L.-S. W.	97.9	6.76	168	11.9	81	195	83	140	14.3	97	195	98
I. G. N.	100.0	9.08	168	11.9	108	—	108	140	14.3	130	—	130
T. & N. O.	100.0	7.15	168	11.9	85	—	85	140	14.3	102	—	102
T. & P.	100.0	7.10	168	11.9	85	—	85	140	14.3	102	—	102
C. R. I. & P.	54.3	8.11	168	11.9	97	124	110	140	14.3	116	124	120
Sou. Pac.	93.3	8.39	168	11.9	100	107	100	140	14.3	120	107	119
Averages	81.4	8.00	168	11.9	95	122	100	140	14.3	115	122	116
Averages of Groups I and II	45.9	8.12	155	12.9	105	115	110	140	14.3	116	115	115

Table II—Freight Service 1941 (Gross Ton-Miles Including Locomotive and Tender)

			SECTION 1					SECTION 2				
			Equiv. val. used electric to coal		Equivalent coal in lb. per 1000 g. t. m.			Avg. equivalent value		Equivalent lb. coal per 1000 g. t. m.		
Road	Per cent g. t. m. with electric locos.	Electric power consumed—kw. hrs. per 1000 g. t. m.	Kw. hrs. per ton (3)	Lb. coal per kw. hr. (4)	Elec. locos. (5)	Steam locos. (6)	All locos. (7)	Kw. hrs. per ton (8)	Lb. coal per kw. hr. (9)	Elec. locos. (10)	Steam locos. (11)	All locos. (12)
Group I:												
Gt. Nor.	1.4	32.22	350	5.72	184	91	96	470	4.25	137	91	96
C. M. St. P. & P.	8.7	30.19	380	5.26	159	109	115	470	4.25	128	109	112
N. & W.	2.5	84.46	684	2.92	246	83	87	470	4.25	338	83	91
Averages	4.3	41.00	470	4.25	174	96	100	470	4.25	174	96	100
Group II:												
Virginian	33.4	37.96	1,094	1.83	69	106	94	470	4.25	162	106	125
Penna.	14.1	21.49	1,333	1.50	32	124	112	470	4.25	91	124	120
N. Y. N. H. & H.	19.2	25.31	1,363	1.47	37	118	103	470	4.25	108	118	116
Averages	15.5	23.80	1,265	1.58	37	123	110	470	4.25	101	123	120
Averages of total Groups I and II	10.8	26.62	870	2.30	60	111	106	470	4.25	113	111	111

roads, i.e., 470 kw. hrs. per ton of coal or 4.25 lbs. of coal per kw. hr. When calculated in this manner the effects of differences in the equivalent values used for equating electric power to coal on the different roads are eliminated from the computation and the effects of the differences in the actual unit consumption of electric power, in kw. hrs. per 1,000 gross ton-miles, alone appears. This produces an average for the Group II roads of 101 lbs. of equivalent coal per 1,000 gross ton miles made with electric locomotives, Column 10, instead of the average of 37 which was actually reported, Column 5.

Followed through to the final unit, equivalent pounds of coal per 1,000 gross ton-miles made by all locomotives, Col. 12, the average for the Group II roads becomes 120 instead of the 110, Col. 7, which was actually reported and of course the unit for each individual road in the group is correspondingly raised as shown by the comparison of Columns 7 and 12.

The committee believes that the demonstration afforded by these exhibits offers ample evidence of the important effect upon the fuel performance finally reported that is exercised by the mere choice of the equivalent values used in equating the several forms of fuel and power to coal. Unquestionably accounting officers are interested in the accurate reflection in the reports of the performances that are actually being made with the fuels and power consumed on their respective roads. We direct their attention to the apparent inconsistencies of the present situation with respect to the figures in these reports.

We advocate a basis of equivalence with which we have found no disagreement in principle: A consistent equating value for any form of fuel or power is one that will produce a fuel unit, in pounds of equivalent coal per service unit, of the same order of value as that produced on the same territory by coal burning locomotives in the same kind of service, and therefore the conversion factor or equating value used should be such that a road using electricity, fuel oil, gasoline or Diesel fuel could at any time return to the use of coal without affecting the values of the fuel performance units on the territory in question.

The report was signed by E. E. Ramey (chairman), fuel engineer, B. & O., Baltimore, Md.; P. E. Buettell, fuel supervisor, C. M., St. P. & P., Chicago; J. G. Crawford, fuel engineer, C. B. & Q., Chicago; J. R. Jackson, engineer of tests, Mo. Pac., St. Louis, Mo.; H. Morris, superintendent fuel and locomotive performance, C. of N. J., Jersey City, N. J.; E. G. Sanders, fuel conservation engineer, A. T. & S. F., Topeka, Kans.; W. R. Sugg,* superintendent fuel conservation and lubrication Mo. Pac., St. Louis, Mo.; W. J. Tapp, supervisor fuel conservation, D. & R. G. W., Denver, Colo.; R. J. Tucker, assistant to fuel supervisor, C. & O., Richmond, Va.; and R. S. Twogood, fuel engineer, Sou. Pac., San Francisco, Calif.

The Relation of Coal Sizes to Fuel Economy

The committee recommends cleaned sized coal 2 in. to 2½ in. by 0 in. for stoker-fired locomotives and 4-in. mine run for hand-fired locomotives

S. A. Dickson, Chairman

This year your committee on Coal—Various Sizes in Relation to Fuel Economy, realizes the importance of continuing and advancing our 1941 report under the heading, "Coal-utilization of the various sizes." That report showed that the smaller sizes of coal can under certain conditions be used to advantage.

In the present report we will endeavor to show the relative values of various sizes as a steam locomotive fuel. It will be noted that this subject makes no reference to chemical analyses, the price delivered, or the manner in which it is fired, i. e., mechanically or by hand. But as it can not be assumed that the coal which shows the best performance on a thousand gross ton mile basis would be the most economical on a cost basis, we should set opposite the 1,000 gross ton-mile figures the money value. If that is done, what follows will apply with equal force to the different grades of coal (British thermal units value) used on the various railroads.

In considering the use of smaller size coal it is very important that the cost per ton from the various mines be reduced to a B.t.u. basis. Other factors being equal, the coal with higher heat content would be the most economical to use.

On all coals available for locomotive use a complete analysis of each size of coal should be made for each mine. In some instances the nut or egg size of coal will show better by analysis than the lump or smaller sizes below the nut size. In other instances the smaller sizes of coal will show better than the nut, egg or lump.

Preparation of coal is of utmost importance, particularly when considering the use of the smaller sizes on locomotives. In mining operations coal naturally is broken down to a certain extent, which produces screenings and such screenings naturally will contain a great deal of fines and impurities such as fire-clay, bone, rock, etc. It is difficult to remove such impurities from the smaller sizes of coal by hand picking. Such coal is not satisfactory for locomotive use if the percentage of screenings exceeds 35 to 40 per cent of the total coal. Where coal companies are equipped with mechanical cleaning plants, they mechanically clean all coal that will pass through a 2-in. round-hole screen. Such coal

* Mr. Sugg is now general supervisor of air brakes at St. Louis, Mo.

makes an excellent locomotive fuel, particularly for mechanically fired locomotives. This same coal might be very inferior for locomotive use if not mechanically cleaned.

The design of the locomotive boiler and fire-box is an important factor when considering the use of the smaller sizes of coal. They can be more economically burned in locomotives that have large fire-box volumes which are provided with combustion chambers. A large fire-box volume with a combustion chamber will permit the smaller sizes of coal to be more thoroughly burned before they enter the flues.

Locomotives that have large grate areas can use the smaller sizes of coal more economically than locomotives with small grate area. The openings through the grates should be small and designed to avoid direct fuel-bed bombardment if possible. But enough total area should be provided to admit sufficient air for complete combustion of the coal. Grates with large air openings are undesirable for the reason that the small sizes of coal will fall through.

Generally it is not found economical to use the smaller sizes of coal on hand fired locomotives. On the other hand, where well prepared coal contains as much as 65 per cent screenings, and can be obtained at a differential in price, sufficient to justify its use on mechanically fired locomotives, the smaller sizes of coal when properly prepared and mechanically cleaned will contain more British thermal units per pound than the egg or nut coal. This produces further fuel economy due to the higher heat content. The use of hand fired locomotives will, of course, become less each year due to the increase of mechanically fired locomotives.

On territories where both hand and mechanically fired locomotives are operated, coal chutes with separate bins for hand and mechanically fired coals are almost a necessity.

It is most desirable when calculating the locomotive fuel performance on a 1,000 gross ton-mile passenger car mile and switch locomotive hour basis to have a coal containing as small a percentage of ash and moisture content as is consistent to obtain. Any reduction that can be made of this non-combustible substance in the coal will increase the B.t.u. content per pound of fuel as fired. The best known method found to date for reducing to a minimum this non-combustible material in the raw coal is by mechanical cleaning.

The tests covered in the University of Illinois' Bulletin No. 101 show that run-of-mine coal is the most economical fuel for hand firing operations. This test was made on a stationary test plant. Therefore the results could not be set up on a 1,000-gross-ton-mile basis. Nevertheless, the data is so comprehensive that it can logically be assumed that on a 1,000-gross-ton-mile basis, run-of-mine coal would still occupy the same position in relation to lump, egg and 2-in. screenings. The 1¼-in. screenings tested were mechanically fired and therefore are eliminated in the present analysis. In fact, as these tests have since been confirmed in road tests, we can safely accept them as conclusive and on that basis recommend the use of run-of-mine coal for all hand-fired locomotives.

The University of Illinois test data show clearly why run-of-mine coal, hand fired, gave a better all-round performance based on continuous operation, but, as in general locomotive operation and particularly in yard service, the demand on the boiler changes almost instantly from full load to no load and vice versa it is necessary to carry a fire of sufficient depth to meet instant maximum demand. This practice is not economical.

A booklet was issued by the United States Railroad Administration during the last war titled, "Economical Use of Locomotive Fuel." As this booklet may no longer be generally available, we will give a brief synopsis of a test and the results. The test was conducted in regular road service, the purpose of which was to determine, if possible, first, the drop in fire-box temperature when the fire-door was held open continuously while two scoops of coal were being fired and, second, to determine the drop in temperature when the fire-door was held open continuously while eight scoops of coal were being fired and then kept closed until another firing was required.

As it was impractical to take direct fire temperatures with the equipment at hand, superheat temperatures were used as indicated by the pyrometer. When but two scoops were fired, the average superheater temperature drop was 10 deg. When eight scoops were fired, the average superheat temperature drop was 30 deg. This denotes the advisability of keeping the fire-door closed as much as possible.

It is easier to abate objectionable smoke when maintaining a bright fire by keeping the fire-door closed and using the blower. When the fire is green and dark red in color, the fire-door will have to be opened and the blower valve opened to abate the smoke nuisance.

The air passing through the fuel bed controls the rate of combustion. The air passing over the fire controls the efficiency of combustion. It requires about 11½ lb. of air by weight, or 150 cu. ft. by volume, to supply enough oxygen to burn one pound of average bituminous coal, and about half as much for lignite. But as some excess air is needed, we can use as our factor about 15 per cent more.

The velocity of inflow is proportional to the difference in pressure above and below the fuel-bed and will average from 50 to 150 ft. per sec. depending on the rate of combustion, regardless of the amount of air opening through the grates.

If the air openings through the ash pan are not sufficient to maintain atmospheric pressure below the fuel-bed at all rates, it follows that the pressure above the fuel-bed in the firebox will be decreased correspondingly. This means a higher draft and usually a smaller nozzle.

During a test in 1926 some observations were made through 2-in. openings piercing the sides of the firebox. It was noted that over certain parts of the fuel-bed relatively large pieces of coal were apparently caught by the draft currents passing through the fire, and lifted into the zone of high gas velocity. From there they were carried over the arch and eventually out the stack, while at other points equivalent pieces were only lifted a short distance and fell back on the fuel-bed to be totally consumed.

Investigation indicated that some of the grate bars (finger type) had moved laterally, thereby increasing the air openings at some points and restricting them at others. This difference in areas correspond with the difference in a lifting effect of the vertical air jets, as a readjustment of the grates apparently equalized the lifting action. On these observations was based the theory that the lifting action of the vertical air jets is proportionate to the square of their area. If these areas were reduced so that the smaller particles of coal would not be projected into the high velocity gas streams cinder discharge would be correspondingly reduced. The correctness of this theory is well supported by the New York Central Selkirk tests, where moving pictures were obtained showing for the first time in the history of the steam locomotive the actual behavior of the fire-bed under various rates of combustion.

Small sized coal, properly cleaned, can be economically

burned in a mechanically fired steam locomotive without appreciable stack loss or cinder cutting, providing the necessary affecting details are adapted to that purpose. These details, in the order of their importance, are as follows:

1. A dumping locomotive grate so designed as to permit the necessary inflow of air to support combustion and at the same time eliminate vertical air jets.
2. Plenty of air opening into the ashpan with pan flares extending slightly above the bottom level of the mud-ring. The clearance between ashpan and mud-ring should be at least 18 per cent of the total grate area.
3. A brick arch sealed at the throat sheet, the area of the opening between the back of the arch and the crown sheet to be not less than 120 per cent of the net gas area of all the tubes and flues.
4. Reduce to a minimum all obstructions in the front end tending to restrict the free flow of gas to the stack.
5. An exhaust nozzle as large as possible, consistent with good steaming with the lowest grade of coal used. The lowest grade of coal which is to be used is the number one factor that must be taken into consideration when considering the proper drafting of a locomotive.
6. The greatest possible combustion-chamber volume.
7. An effective locomotive blower, properly used which includes the proper co-ordination of the blower-valve adjustment with that of the main throttle-valve operation.

We recommend run-of-mine, with the lumps larger than 4 in. top size to be reduced to that size as most economical for all hand-fired locomotives. We recommend properly cleaned sized coal not to exceed 2½ in. by 0 as most economical for all mechanically fired locomotives that have not been adapted, as recommended, to economically handle smaller sizes, unless there is sufficient price differential to warrant. We recommend the use of coal as small or smaller than that which will pass through a 2-in. round hole screen opening for all mechanically fired locomotives that have been adapted to its economical use.

The report was signed by S. A. Dickson (chairman), supervisor of fuel economy, Alton; G. B. Curtis, road foreman of engines, R. F. & P.; E. G. Sanders, fuel conservation engineer, A. T. & S. F, and W. J. Tapp, superintendent of fuel conservation, D. & R. G. W.

Combustion-Gas Turbines for Locomotives

A review of recent developments in Europe and the United States—Further proposals for a hydraulic transmission

L. P. Michael, Chairman

Developments have been made in foreign countries and also in this country which are not only worthy of consideration but which should be recorded as definite progress in the construction and use in actual service of combustion gas turbine equipment for producing power from low-grade fuel.

As a description and a record of what has been done in foreign countries, there was printed in the English magazine "Engineering" of April, 1942, an article entitled "The Jubilee of Brown, Boveri & Company." Among the developments which Brown, Boveri & Company had made, was a combustion gas-turbine locomotive for the Swiss State Railways. This article not only described this equipment but also showed several cuts and photographs of it. The locomotive, which uses gas oil, has a rating of 2,200 hp. and a maximum speed of 66 miles an hour. The gas turbine drives a generator providing current for the traction motors on the lines of a Diesel electric locomotive.

Fig. 2, on Plate I, in this issue, also relates to the Jubilee celebration exhibitions, and illustrates what was described as a 1,500 kw. pulverized-coal turbine. Actually it is a gas turbine, with its compressor, in which the fuel gas is produced from pulverized coal. In view of the fact that the great portion of fuel for locomotives in this country is coal, it will be of further interest to know that there are possibilities of continuing its use as fuel when the combustion-gas-turbine engine locomotive is developed.

The latest information on the combustion gas turbine in this country is covered in an article "The Gas Turbine," written by Dr. J. T. Rettaliata, steam turbine department, Allis-Chalmers Manufacturing Company, and is printed in parts I, II, and III in the Allis-Chalmers Electrical Review, September and December, 1941 and March 1942.

This article gives a historical resume of the gas turbine from Nero's time, 130 B.C., to date, and covers the thermodynamics, the thermal efficiency, construction and actual application of this prime mover. Part III concludes with a brief description of the Brown, Boveri Gas turbine-electric locomotive built for the Swiss State Railways, and also gives a photograph of the 2,200 hp. gas-turbo-electric power unit for this locomotive.

An arrangement diagram of a 5,000 hp. hydraulic transmission, locomotive weighing 112 lb. per rail horsepower and capable of speeds up to 120 m.p.h., is shown in this part of the article. Final conclusions in part III are as follows:

"A recapitulation of the material herein presented indicates that the future of the gas turbine becomes more promising with the adoption of higher temperatures. Continued metallurgical advances and effective cooling methods bring operation at elevated temperatures ever closer to the realm of practicability.

"Field experience with the units already in operation

indicates their design to be conservative, and no troubles attributable to operating temperatures have been encountered. Based upon this experience, as well as that of supercharger work, it is believed that operation at temperatures higher than those now in use is entirely feasible and that it can be accomplished with an adequate margin of safety.

"Improvement in thermal efficency, made possible by the use of regeneration and increased temperatures, makes the gas turbine a serious aspirant as a prime mover for certain applications. Because of the low grade of fuel it can use, the gas turbine, even when operating at present temperature levels without regeneration, compares favorably on a fuel cost basis with other methods of power production.

"Undoubtedly the gas turbine has certain natural applications which make the cycle appear attractive. The advantages associated with the elimination of the high pressure, high temperature steam boilers, and the attendant feedwater problems from a power plant are obvious. At present the cycle is only applicable where liquid or gaseous fuels can be used although research has shown some promise for the application of pulverized fuel for this service.

"The gas turbine is not regarded as the answer to all power problems since its limitations are well recognized. It is believed, however, that it possesses definite features which ideally adapt it for certain classes of service; and it is toward this end that the present development is being directed."

Gas Turbines for Air Craft Superchargers

Since the above article was written, the Allis-Chalmers Mfg. Co. have advised as follows:

"Allis-Chalmers is now actively engaged in the construction of turbo-superchargers for aircraft. The experience that is being gained through this activity should aid us greatly in our other gas turbine pursuits.

"We wish to point out that our activities in the gas turbine field have been primarily concerned with the development of a highly efficient, light weight unit as we believe that this is the basic objective to be accomplished. After it has been demonstrated that it is possible to construct such a unit, then adapting it to locomotive, marine, or other types of drives is mainly a matter of application. Therefore, even though in our present studies a great deal of time is not being devoted to the locomotive application itself, we believe it will be understood that the work which we are doing is of prime importance and a contributory factor to a successful locomotive design.

"The Battelle Memorial Institute is conducting an extensive research program on high temperature materials for us. The results obtained so far from this research are highly promising and the indications are that materials are now available which have especially good properties. One limiting feature in the design of a high temperature gas turbine appears to be the creep rate of the materials employed. Materials are now available which have creep rates of 1 per cent in 100,000 hours (11.4 years) at a temperature of 1,500 deg. F. and a stress of approximately 4,500 lb. per sq. in.

"Our design studies of high-temperature gas turbine units have laid particular emphasis on adequate cooling of the various high temperature parts as this is of great importance in achieving successful operation."

The above reports on the progress and development made on the combustion gas turbine are certainly very encouraging and this Committee has proceeded to outline a gas turbine application to a 6,000-hp. locomotive with single cab carried on two six-wheel trucks, similar in arrangement to the one proposed in last year's report, except that the transmission of power from the two 3,000-hp. gas turbines, 1000 hp. to each pair of driving wheels on the trucks, will be considerably simplified.

Careful checking indicates that the transmission of 3,000 hp. to each of the two six-wheel trucks can be made through two sets instead of four sets of hydraulic torque converters and couplings, one set for forward and one set for reverse motion of the locomotive. The hydraulic torque converters will increase the starting tractive force, similar to the low gear on an automobile transmission, and the hydraulic couplings will transmit the power from the turbines to the driving wheels, at higher speeds, efficiently cushioned and without shock to the shafts and gearing in the power transmission.

The hydraulic torque converters and couplings also provide a very practical, rugged and efficient means of reversing the direction of movement of the locomotive in that they can be so arranged and geared that by using two sets, one set geared to drive the locomotive in one direction and the other set to drive in the opposite direction, and the hydraulic fluid (oil) delivered only into the one set giving the direction of movement of the locomotive as desired, while the other set is idling, with very low resistance, in the opposite direction.

A Proposed Locomotive Transmission System

In the design of the proposed locomotive, the speed of the 3,000-hp. gas-turbine shafts will be about 6,000 r.p.m. at a speed of 120, or 4,000 r.p.m. at 80 m.p.h. for the locomotive. This turbine-shaft speed will be geared down to about 2,400 r.p.m. at 120, or 1,600 r.p.m. at 80 m.p.h. of the locomotive, for the hydraulic torque converters and couplings.

At full load, from about 70 or 80 m.p.h. and upward, the hydraulic couplings will be turning about two per cent faster than the driving shaft to the trucks, on account of the cushioning and slippage of the fluid in the hydraulic couplings.

The shaft from the hydraulic couplings to the driving wheels is to be of dynamic steel tubing and is to have two universal joints in it between the hydraulic coupling and the driving axle and also between the three driving axles in each truck.

Each driving axle is to be equipped with a 42-in. pitch-diameter, 70-tooth hypoid gear which is to mesh with a 23-tooth pinion on the driving shaft. The gear to pinion ratio is, therefore, 3.04348.

It is proposed to use Timken tapered roller bearings on the driving shaft and on the axle carrying the housing for the hypoid gear and pinion and also for the driving axle bearings carrying the weight of the locomotive.

It is planned that the speed in revolutions per minute of the pinion, driving shaft and universal joints will be approximately the same as the speed in r.p.m. of the 500-hp. motor armatures on the Diesel-electric locomotives used on the streamline trains now in service. This speed is about 2,350 r.p.m. at 120 m.p.h. for the locomotive. The armatures on these motors range from 18 in. to 20 in. outside diameter.

It is proposed to make the centers of $3\frac{1}{16}$ in. diameter by $2\frac{5}{8}$ in. long bearings on the universal-joint pins travel in a 17-in. circle and the outside of the pin-bearing housing about 21 in. in diameter.

In other words, the peripheral speed of the center of the universal joint pin bearings will be less than the peripheral speed of the outside of the armatures on the 500 hp. motors used on the Diesel-electric locomotives in road service. The outside ends of the housings for the universal joint pins will travel at a proportionately higher speed.

Further, with the gear ratio proposed, the peripheral speed of the center of the universal-joint pin bearings will be approximately the same as the outside tread of the 52-in. driving wheels and therefore is the same as the speed of the locomotive. Therefore, the bearing pressure on each pair of universal joint pins, nearest to the hydraulic couplings, will be the same as the drawbar pull exerted by each truck, which may be operated separately or both may be operated at the same time.

In the design which has been outlined for the universal joints it is proposed to use pressed-in removable bearing pins with surfaces treated to given a high Brinell, after which they will be ground to the correct size and finish. It is proposed to use Super-Oilite 16 bearings, oil sealed, for the universal-joint pins.

The combustion gas-turbine locomotive proposed in this report will have one cab about 80 ft. long, about 10 ft. 4 in. wide and about 15 ft. 3 in. high, and have a dimension of about 83 ft. over pulling faces of couplers, which is practically the same as this dimension for the full sized cars used on the modern streamlined trains now in service.

The wheel base of this locomotive will be about 71 ft. The weight, fully loaded ready for service, is estimated not to exceed 420,000 lb., which would be 70,000 lb. per pair of wheels, at the rail, for the six pairs of wheels which are to be 52 in. in diameter, steel tired. This weight will include 35,000 lb. of fuel oil and 25,000 lb. of water for the boilers required to furnish steam for car heating.

The weight of the locomotive light, except for sand, lubricating oil and supplies, is estimated at about 360,000 lb., which would be 60,000 lb. for pair of wheels at the rail. The tractive force, with all six pairs of wheels driving will be about 90,000 lb. which will give a factor of adhesion of four with the light weight of the locomotive, or a factor of adhesion of 4.666 with the locomotive fully loaded.

In other words, this design provides a 6,000-hp. locomotive weighing 420,000 lb. or 70 lb. per hp., which is less than half that required for the Diesel-electric locomotives now in road service.

The report was signed by L. P. Michael, chairman, chief mechanical engineer, C. & N. W.

Diesel-Electric Problems of the Road Foreman

Instructions for enginemen in handling the controls of Diesel-electric switchers to protect the electrical equipment

W. D. Quarles,
Chairman

In yard service the engine crews operate Diesel-electric locomotives without the assistance of a trained supervisor other than the road foreman of engines. Therefore, the road foreman must obtain sufficient knowledge of the equipment to enable him to impart such knowledge to engine crews in order to perfect their ability to perform with reasonable satisfaction. The engineman must first be taught the correct procedure in starting and stopping the Diesel engine. If the engine does not rotate when the starter button is engaged, he must make sure that all controls and switches are in the correct position and starting contactors operate when the starter button is engaged. If all circuits are found to be correct and the engine will not rotate fast enough, then try to start with half of the relief valves open, preferably in firing order. When the engine starts, the starter button must not be released until the engine has assumed sufficient speed to reduce the current flow in the starting circuit to prevent burning and pitting the starting contactors. Before moving the locomotive air pressure must be high enough to operate reverser and power switches for a good electrical connection in addition to having an adequate supply of air for the brakes.

It is most important that the temperature of the engine be controlled within the operating range of 150-170 deg. Low temperature lowers the overall efficiency of the Diesel engine due to improper combustion. Water, being a product of combustion, condenses on the walls of comparatively cool liners, interfering with lubrication and possibly combining with carbon-dioxide, another agent of combustion to form carbonic acid which acts on the metal of the liner and piston, causing wear at a rate three times faster than normal. Varying temperature (hot to cold) sets up stresses due to expansion and contraction of parts of the engine, causing cracked heads, liners, piston and leaking gaskets. High temperature of lubricating oil will cause a heavy carbon formation. If the Diesel engine responds to throttle operation but the locomotive will not move it will be necessary for the engineman to check reverser, power switches, exciter or battery field circuit for defects such as a blown fuse or poor electrical connection on contactors, relays, or relay interlocks. A locomotive should never be run over a track on which water is over the rails without some competent person preceding it and measuring the depth of water. If not in excess of 5 in. the locomotive can be drifted through with power off the traction motors at a speed not over two to three miles per hour, after which an inspection must be made of the traction motors by removing inspection covers to determine if the moisture has evaporated. Power should not be again applied to motors until they are known to be free of all moisture. If the engineman does not see the water in time to take the action mentioned he should immediately close the throttle to idle even though it required closing the throttle without proper time element.

Excessive use of sand is objectionable to the elec-

trical equipment, having an abrasive effect on the commutator and motor bearings. Its accumulation on the equipment will conduct the high voltage circuit to ground particularly when wet. Sand must never be used when wheels are spinning. While this is a lesson learned with steam-locomotive operation, it is more important with Diesel-electric as the fly-wheel action of the motor armature will overstress the pinion gear when the wheel to which it is geared is too suddenly brought to rest. Overstressing of the gears also occurs when brakes are used while power is applied.

On some Diesel switchers, through a scheme of wiring in the control circuit, the reversing drum and power switch are synchronized with the reversing lever and, with this arrangement, if the motor fields are reversed while the locomotive is moving, considerable damage might occur to the electrical equipment by regeneration from the traction motors. Therefore, never shift the reverser until the locomotive is at rest. Where the air compressor is connected to the crank shaft and it is necessary to pump up air while the locomotive is in motion, kill the excitation on the main generator before opening the throttle as this will disconnect the motors.

Slid-flat power wheels have a very detrimental effect on traction-motor windings. Therefore, skidding can and must be avoided. There is nothing inherent about a Diesel which will contribute to sliding wheels. On the contrary the fly-wheel action of the traction-motor armatures tend to keep the wheels rolling against braking force. While this is more or less true there have been many flat wheels on this type of locomotive. Invariably they are caused by improper brake manipulation. The engineman, in switching off cars, should endeavor to stretch the slack with light cylinder pressure before developing the maximum obtainable. By so doing there will be no heavy change of slack to shift the weight from the locomotive wheels to reduce the adhesion; it is a lack of adhesion which will cause the wheels to slide with a given braking force under normal conditions. With bad rail conditions the engineman should apply that same good judgment which he was taught to apply when handling other types of power. All should understand that with any electrical transmission a derailed power truck must never be rerailed by aid from the derailed truck as the wheels would ordinarily spin when power is applied, and all traction motors being of the series type, having certain inherent characteristics, this sudden spinning of the unloaded wheel is liable to cause the motor armature speed to increase to dangerous proportions, wrecking the entire motor. While switching locomotives are mentioned, the foregoing is applicable to Diesel freight or passenger operation.

The road foreman of engines in steam locomotive operation had the problem of the human equation in getting enginemen to handle steam engines so as to get maximum efficiency from the machine by co-ordination of the reverse lever and throttle manipulation. Some enginemen seemingly could not make the time or negotiate the ruling grade with a tonnage with which others experienced no trouble whatever. This difference in enginemen was somewhat narrowed by the valve pilot and back-pressure gauge. With Diesel power there is no difference between enginemen in this respect as the Diesel engines respond the same for any engineman in a given throttle position. However, the road foreman of engines does have a problem in the Diesel operation far greater than that of steam. It is true that the Diesel engine is protected from overloading by automatic electro-mechanical devices, but there is no protection afforded the electric transmission. The road foreman is faced with the problem of protecting this by training enginemen never to stop with the power applied and never attempt to start until the brakes are fully released and always to operate with the traction motors in the correct operating characteristic corresponding to the speed.

Traction motors used for Diesel-electric motive power are almost invariably of the series type. In operating a train with this type of motor any increase in grade which causes the train to slow down results in an increase in current flow. Increase in current flow causes increases in temperature. If the motor and generator are then subjected to temperature higher than the critical for the insulation, the insulation becomes charred. It is this overheating which the engineman prevents when complying with operating instructions and with which the road foreman must insist on full compliance.

The report was signed by W. D. Quarles (chairman), general mechanical instructor, A. C. L.

Locomotive Maintenance Officers' Association

(*Continued from page 478*)

him for greater responsibility, but make him even more valuable as his career advances.

Make Supervisor Part of Official Family

The final thought this committee would like to leave with you is that as soon as a man is made a supervisor, he should be made to feel that he has become a part of the official family. To this end, treat him so that it will be evident to him and to all other employees. See that he is given full information on the company's policies in all matters which he handles. Let him know that he is to be the advisor of his immediate superior. Don't countenance one supervisor going over the head of another in giving orders, seeking advice or in the administration of discipline. Give him a place at your production, routing, safety and other shop activity conferences. Encourage him to express his opinions. Where they are not sound, explain the fallacy in them to him patiently but thoroughly. When they are sound, let him know that they are appreciated and if it is possible to put them into effect see that he is credited with them. Increase his responsibilities as he shows himself able to assume them and let his promotion be in the same proportion.

It is our firm belief that the recommendations heretofore expressed on the selection, procurement and training of supervisors, if followed, will produce an organization which will function smoothly and efficiently, will be amenable to rapid expansion under increased load and at the same time be loyal and understanding in adversity.

The report was submitted by F. K. Mitchell (chairman), assistant general superintendent motive power and rolling stock, New York Central, New York; C. P. Brooks, mechanical engineer, Erie, Cleveland, Ohio; Elmer Butler, assistant production engineer, Missouri Pacific, Little Rock, Ark; K. Berg, superintendent motive power, Pittsburgh & Lake Erie, McKees Rocks, Pa.; W. W. Haggard, general foreman, locomotive department, Atchison, Topeka & Santa Fe, Topeka, Kan.; W. V. Hinerman, assistant to superintendent motive power, Chesapeake & Ohio, Richmond, Va.; T. B. Roberts, supervisor apprentices, Lehigh Valley, Sayre, Pa.; H. J. Schulthess, chief personnel, Denver & Rio Grande Western, Denver, Colo.; J. A. Malsi, apprentice instructor, Louisville & Nashville, Louisville, Ky.; A. H. Williams, general supervisor apprentice training, Canadian National, Montreal, Que., and Roy V. Wright, editor, *Railway Mechanical Engineer*, New York.

Constructive Reports on Car Subjects

(*Continued from page 469*)

word "Owner" at the end of the second to the last sentence place comma, and add the following: "and the cost of movement to such designated point shall be assumed by car owner in the absence of any other agreement for disposition of such transportation costs."

Reason.—To clarify that owner desiring car to be returned home must assume all expense involved, including the transportation costs involved.

Passenger Car Rule 7

Rewrite Sec. J in its entirety as follows:

U Type Valves

Not cleaned within 15 months, as indicated by standard markings, must be cleaned.

Not cleaned within 14 months, as indicated by standard markings, may be cleaned regardless of whether car requires other repairs.

Equalizing or quick-action portions, or brake cylinders may be cleaned separately, including separate stenciling, if defective within 12 months. In the event either part becomes defective after 12 months the entire brake system must be cleaned.

Slack adjusters must be cleaned each time brake cylinder is cleaned.

Retaining valve and centrifugal dirt collector must be cleaned each time any part of this equipment is cleaned.

Other Than U Type Valves

Not cleaned within 12 months, as indicated by standard markings, must be cleaned.

Not cleaned within 11 months, as indicated by standard markings, may be cleaned regardless of whether car requires other repairs.

Triple valve, brake cylinder, retaining valve, slack adjuster and centrifugal dirt collector must all be cleaned at the same time.

L-2 triple valves applied in repairs must be equipped with Westinghouse graduating spring and cap nut (piece Nos. 92073 and 92074) for which additional charge is permissible.

This includes D-22 type brake equipment.

General

The place, month, day and year of last cleaning and oiling and the initials or name of road to be stencilled with white paint in a suitable location for inspection.

Valves cleaned must be removed from car and tested in accordance with A.A.R. standard code of tests for repaired triple valves, including the checking with A.A.R. standard triple valve wear limit gages, suitable for the particular type valve being cleaned.

Provisions of Sections (h), (i), (j), (k) and note following Sec. (k) of freight car Rule 60 are applicable.

Note—When brake system is cleaned water-raising system must also be cleaned.

Reason.—To make for more ready reference. To provide for the cleaning of brake equipment at a time when the cars are idle, thus avoiding their being delayed under load or their empty movement in the direction of loading points being interrupted, thus increasing the availability of passenger car equipment, carrying cars as well as head end and express refrigerator cars. Also to incorporate into the passenger section certain provisions of the freight rules that have proven by test to be of benefit.

Eliminate Sec. K. Entirely.

Reason.—The listing of the amount of piston travel in the freight car rules is not deemed necessary as this feature is covered by general instructions. It should, therefore, not be necessary in the passenger section. The present listing is in conflict with good practices, the D-22 type system as well as the truck mounted AB-type cylinders require less travel than is specified in the present rule. To list a measurement for one type of brake would require the listing of the proper travel for all types. This appears unnecessary in a code of interchange rules.

Eliminate Interpretation 2 entirely.

Reason.—Covered in revised Sec. (j) of this rule.

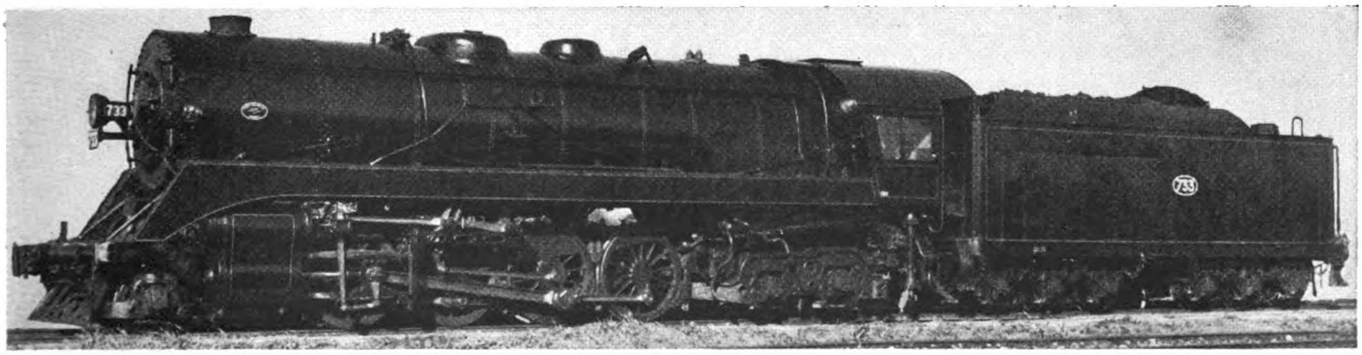
Passenger Car Rule 22

In Item 2, recommend that separate allowance be incorporated in this rule to cover application of brake shoes on streamlined cars.

Reason.—Present allowance is far below the actual cost of application, due to inaccessibility involving much more labor than is required on the ordinary car.

The report was submitted by E. G. Bishop (chairman), general car foreman, Illinois Central, East St. Louis, Ill.; D. E. Bell (vice-chairman), A. A. R. instructor, Canadian National, Winnipeg, Manitoba, Can.; W. J. Burns, mechanical inspector, General American Transportation Corporation, Chicago; F. McElroy, chief clerk to vice-president, Union Tank Car Company, Chicago; C. A. Erickson, general A.A.R. inspector, Chicago & North Western, Chicago; M. E. Fitzgerald, master car builder, Chicago & Eastern Illinois, Danville, Ill.; C. W. Kimball, assistant supervisor of car inspection, Southern, Atlanta, Ga.; F. J. Larrissey, chief A.A.R. inspector, Erie, Cleveland, Ohio; J. E. Mehan, assistant to superintendent car department, Chicago, Milwaukee, St. Paul & Pacific, Milwaukee, Wis.; C. A. Mick, chief clerk-mechanical, C. B. & Q., Chicago; F. H. Stremmel, assistant to secretary, Mechanical Division, A.A.R., Chicago; C. R. Wiegmann, chief interchange inspector, St. Louis-East St. Louis, Terminal District, St. Louis, Ill.

* * *



One of nine 2-8-4 type locomotives now being built at the Islington workshops of the South Australian Railways

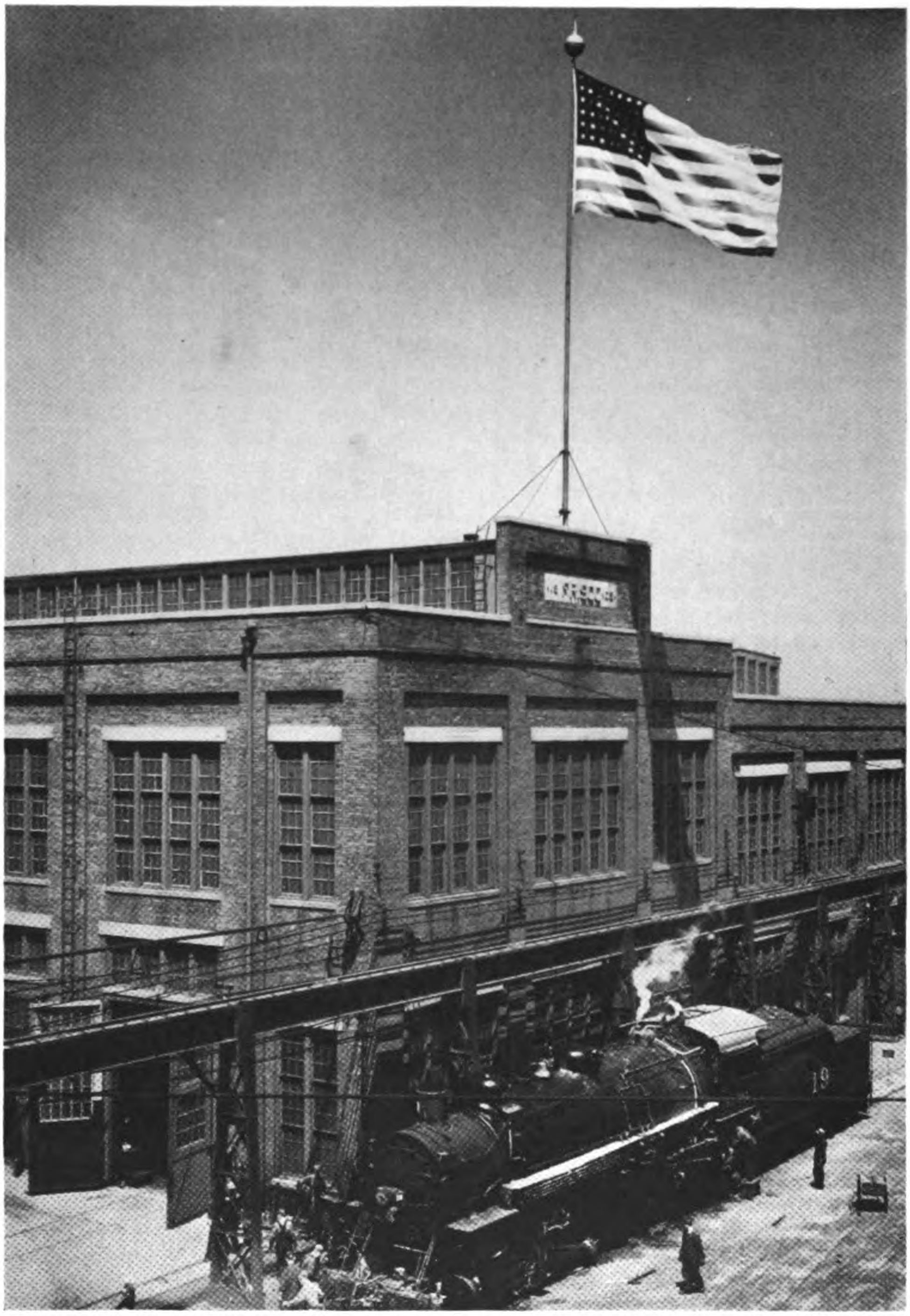


Photo from St. Louis-San Francisco, Springfield, Mo.

The Equipment Department Renders Distinguished Service

For the first time on American Railroads steam locomotives out of service for repairs are less than 7 per cent of steam locomotives on line and bad-order freight cars less than 5 per cent—On September 1 out-of-service locomotives were 6.6 per cent and bad-order cars 3.1 per cent—Freight locomotives made over 67 million miles and freight cars over three billion miles in August, more than the highest months in 1928 and 1929 when the previous record was established—Many railroad shops are also participating in war production

The Effects of a Good Housecleaning

For years those in charge of shops and enginehouses have resorted to all kinds of methods to get supervisors and workmen to clean things up and keep them clean. Natural pride will cause some people to keep the places where they work and the things they work with in a clean and orderly condition. Others are just naturally sloppy. That's why an ingenious supervisor invented the prize award for the dirtiest department in the shop.

Along comes the war, with shortages of rubber, copper, alloy steels, tools, and almost everything else that we need to carry on the job. One of the first things that could be done was to pick up the things that could be used—or sold for scrap. In the process there came to light thousands of pounds of materials that are now almost worth their weight in gold.

It took the housecleaning to find out where we stood. Having found that out, most shops are finally being forced to do the things they should have done years ago—for their own good. War is not without its benefits, but it's a hard way to learn.

Measuring Locomotive Performance

Hardly anything looms larger in the mind of the average mechanical officer, today, than the question of what means can be employed to spread his motive power inventory over a more or less extensive operating territory in such a way as to have locomotives available for all trains when and where needed. With freight traffic increased relatively nine times as much in the last two years as in the two years ending in 1929, for example, and passenger traffic, instead of declining, more than doubled in the same period, the problem of finding enough motive power to go around is a very real one.

According to J. J. Pelley, president of the Association of American Railroads, the proper government agencies are now being asked to authorize the building of 900 new locomotives during the year ending October 1, 1943. But, in the meantime, railroads must move present traffic with the motive power now available. This implies a high degree of utilization which is, of course, impossible without some good measuring stick of locomotive performance to determine where the weak points are and permit correcting them.

Apparently locomotive miles per month is the most commonly used gage of locomotive service and also the one most generally satisfactory in spite of some rather definite limitations. For example, 6,000 miles a month was formerly considered pretty good performance and still is the best average figure obtainable under certain conditions. That being the case, how account for records of 15,000, 17,000 or even 20,000 miles a month now being quoted as secured with steam power in some instances?

The first thing which must be known in comparing locomotive monthly mileage figures is the class of service, as freight power can be expected to make on the average only about two-thirds as many miles a month as passenger power. The use of certain locomotives in both passenger and freight service of course complicates the picture and must be duly allowed for to make any accurate comparisons. It is also important to know the kind of territory in which the locomotives operate, whether level and relatively straight, or mountainous and curving, whether largely main through-line, or including a large proportion of straggling branch lines.

The next consideration is the number of locomotives involved in the comparison, as it is entirely possible to achieve monthly mileages approaching 20,000 with one or possibly a dozen new passenger locomotives receiving special attention under unusually favorable operating conditions as regards long, through runs and short turning time, whereas the average monthly mileage of the entire locomotive ownership on the same road may be exceptionally low. The number of locomotives involved in any comparative performance study is important.

Other factors bearing on the question of how many miles can be produced periodically with a certain class of locomotives include, as suggested above, whether they are new or just out of the shop, whether they are equipped with roller bearings, what their mechanical condition is, what kind of fuel and water are available for use, etc. Operating conditions also have a vital influence on locomotive mileage and the great number of trains now on many of the roads definitely tend to reduce possible monthly mileage in some instances where second-class trains have to take sidings and wait for connections, causing motive power to take much longer than usual in negotiating the same distance. This would naturally invalidate comparisons even of the same type of power on the same division with some period when line congestion did not operate to delay trains.

Locomotive monthly mileage figures, properly compiled and interpreted with care are, in spite of what has been said, a good basis for measuring the efficiency of locomotive use. They should be supplemented, however, wherever possible by analysis on a time basis to show actual locomotive daily hours on the road and hours at the terminal, either undergoing conditioning and repairs, or OK'd awaiting service assignment. Another measuring stick which reflects road performance, was suggested by Mr. Pelley recently when he said that railroads handled 25 per cent more gross ton-miles per active locomotive per month in October, 1942, than in October, 1939.

This exceptional performance shows that, measuring stick or no measuring stick, the railroads know how to get results with their motive power and the present order of the day is "Continue and extend this good work."

No Conventions—A Loss To the Railroads

For the motive-power and rolling-stock departments 1942 will go down in history as another year of no meetings. From the Mechanical Division down, all meetings, plans for which were formulated after the meetings in 1941, were cancelled. In this respect the year is like the depression years, when railroads were too poor and supervisors too insecure to give serious thought to association business.

Then, as now, the Mechanical Division continued the work of most of its committees under the direction of a continuously functioning General Committee. But the so-called minor mechanical associations were cut adrift and, when improved business conditions removed the primary cause for the discontinuance of their work, their revival was in spite of rather than because of the official support they received from mechanical department officers generally or from the Mechanical Division.

The present reasons for a no-meeting year are far different from those which prevailed during the depression. The nation is in the midst of the most desperate struggle of its entire history. The traffic which the railroads have to move is rapidly using up the last margin of reserve of facilities and manpower alike. Some of the materials needed for repairs are not easy to get; new cars and locomotives are still harder to get. Obviously supervisors cannot be spared unless the time they take away from their jobs adds more to their effectiveness than the value of the time lost.

Among the departments of the railroads there is evidence of a marked difference of opinion on the question of the value of time spent at conventions. The American Association of Railroad Superintendents held its annual meeting on May 12-14 and has the dates set for a meeting in 1943. The Roadmasters' and Maintenance of Way Association of America held its annual meeting on September 15-17. The American Railway Bridge and Building Association held its annual meeting on October 20-22. Here is evidence that in at least two of the major departments of the railway organization there is a belief that in times of stress, as well as in normal times, the inspiration which comes from the meeting of minds and personal exchange of experiences at association meetings is of sufficient value to justify the time required for attendance.

The time lost from their posts by the men who attend conventions is a tangible loss—even though the actual effect of the absence of a supervisor, prepared for in advance, may be hard to detect. But the benefits gathered from attendance are too intangible to be measured immediately. The record indicates that the leadership in the mechanical department is less gifted than that of some other departments with the imagination, or the insight into human nature, which makes it possible to understand the value of inspiration and the challenge of a free exchange of ideas in finding solutions of new problems or better means of dealing with old problems. Like every other means of communication, convention attendance speeds up progress.

The officers of the four coordinated mechanical associations, understanding the value of association work, have shown the determination to salvage from the situation caused by the cancellation of their meetings the utmost which the circumstances permit. All have prepared the material for convention programs, the quality of which may be judged by the readers of this issue. Thus the morale of the associations themselves is being fostered and their members are receiving a useful part of the service the associations are set up to perform. But the railroads are the losers because their supervisors have been deprived of that part of the service which can be rendered only when they are in attendance at the annual meetings of their associations.

New Books

WELDING HANDBOOK. *1942 edition. Published by the American Welding Society, 33 West 39th Street, New York. 1,593 pages. Illustrated. Price, $6.00 in the United States, $6.50 elsewhere.*

This is the second edition of the most comprehensive welding publication edited in the United States and includes within its covers the consensus of opinion about all fields of welding. The volume has been prepared to cover, first, the physics and metallurgy of welding and the weldability of steels; second, welding and allied processes; third, materials used; fourth, training, inspection and safety; fifth, design considerations and methods of weld testing and sixth, industrial application of various welding processes.

The index of authors lists the names of 270 individuals who have contributed to the preparation of various portions of the volume. According to the statement of the Welding Society, its aim was to make sure that statements were accurate and recommendations authoritative. Chapter preparations were left to individual committees which, though composed of members from different fields, recognized the desirability of the impartial treatment of subject matter.

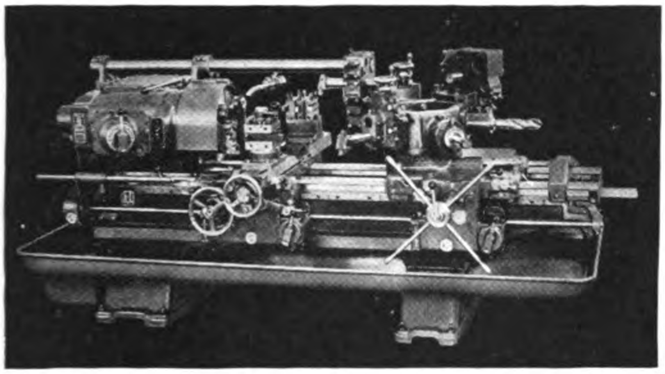
The section on railroads, beginning on page 1405, covers the major developments in the use of welding in car and locomotive construction as well as the outstanding applications of welding to equipment and track repairs. The members of the committee preparing this chapter represented selections from Federal agencies, steel companies, welding equipment and supply companies, private car builders and the railroads.

No railroad library, if the railroad does any welding at all, should be without a copy of this book. It gives users an authoritative, up-to-date source of reference on all technical phases of welding at the same time that, in most chapters, it is so written that non-technically trained men will be able to benefit by consulting it.

NEW DEVICES

Turret Lathes

The Jones & Lamson Machine Company, Springfield, Vt., now has in production its 9A and 10A saddle-type universal turret lathes. The 9A machine has a maximum round-bar capacity of 3½ in. and will swing 23½ in. over the way covers, the 10A machine has a maximum round-bar capacity of 5 in. and will swing 27½ in. over the way covers. Among the features of these lathes are power traversing of the saddle and power indexing of the hexagon turret, both operated by one lever, through which both high and low positive traversing speeds can be obtained.



Simplified controls on these turret lathes speed production

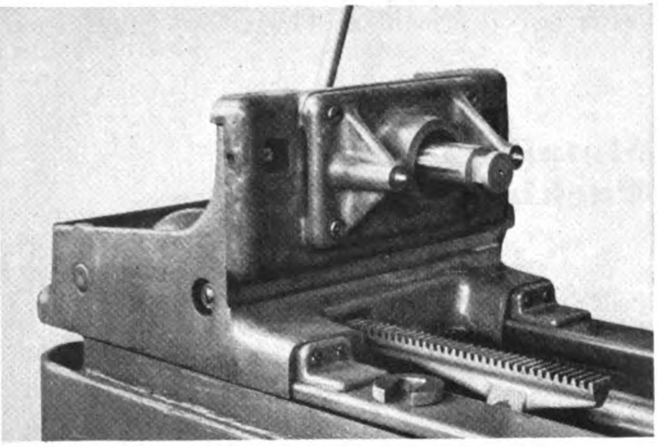
The heavy-duty headstock has an anti-friction transmission and spindle bearings throughout. A built-in power rapid traverse is provided for the bridge-type carriage and cross slide. This power rapid traverse has an all-gear drive and is operated by a single lever, through which all four movements can be obtained. The bar-feed mechanism is power operated. A reversible-torque motor controlled by an electric switch, located on the headstock of the machine within easy reach of the operator, actuates the stock feed-chuck lead screw through a gear train and either advances or withdraws stock as required.

Special Work-Holding Fixture For Threading Machines

A work-holding fixture which provides a means for accurately and rigidly supporting the work piece during the threading operation has recently been developed by the Landis Machine Company, Waynesboro, Pa.

The fixture has a work-aligning arbor on which the work is retained by a collar. A lever-operated cam arrangement at the rear end of the arbor provides a means for drawing and locking the work piece onto two driving and locating pins.

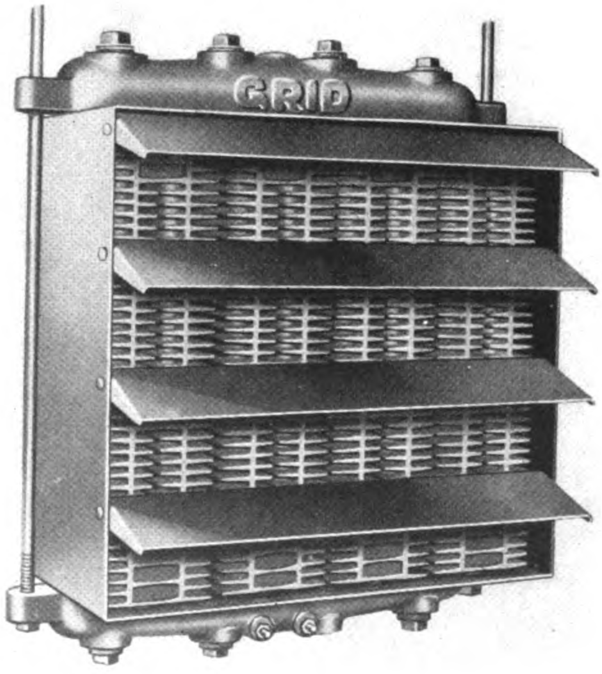
The fixture is fastened to a face plate which bolts on the machine carriage in place of the conventional carriage front or vise. It has both a horizontal and a vertical adjustment on the carriage to assure accurate and permanent alignment of the work piece with the center of rotation of the threading unit. The device was designed with a view of holding to extremely close tolerances for thread concentricity, and to assure maximum production by eliminating the time otherwise required if the work piece was gripped in a conventional vise.



A fixture which provides accurate and rigid support in threading operations

Shop Heating Units

The Grid Unit heaters manufactured by the D. J. Murray Mfg. Co., Wausau, Wis., have been redesigned to utilize cast iron in the heating sections instead of the aluminum of which these parts were formerly made.



Motor-driven heating unit for shops—The grids are cast iron

The units are designed and tested to operate with either steam or hot-water systems, operating on steam pressures from 2 lb. to 250 lb. A feature of these units is said to be a lower outlet temperature which produces a greater volume of air and more air changes per hour, increasing comfort in the working zone and reducing fuel costs. In the design of these heaters care was taken that dissimilar metals should not come in contact with each other in the presence of steam or hot water. Electrolysis is thereby prevented and added life assured. The units are motor-driven and are manufactured in a series of sizes to meet various shop requirements.

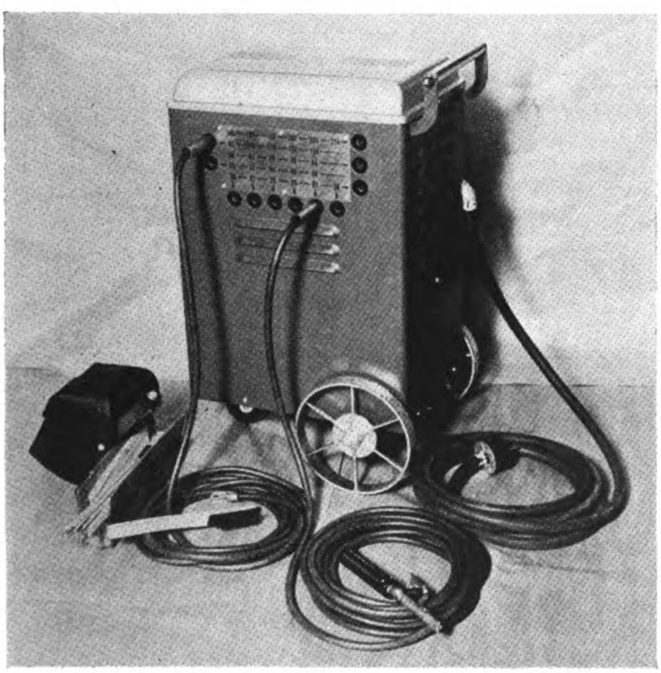
Metallic Plastic Packing

National Engineering Products, Inc., Washington, D. C., is marketing a metallic plastic packing under the trade name "Rodpax," which may be applied for many services. This type of packing is a combination of asbestos fiber, high melting point anti-friction metal, graphite and a special high-temperature-resisting lubricant, which, when compounded, forms a soft and plastic packing material which will retain its resiliency, and possesses a low coefficient of friction.

Rodpax in composition is always ready for instant use and does not require the use of end rings. After packing, under gland pressure, it forms into a solid homogeneous mass, and being impregnated with a lasting high-temperature lubricant, becomes a perfect compressed lubricated bearing.

This packing is available in four standard grades which will meet nearly every condition, thus making possible considerable reduction in packing inventories. It will conform with any size and shape of stuffing box.

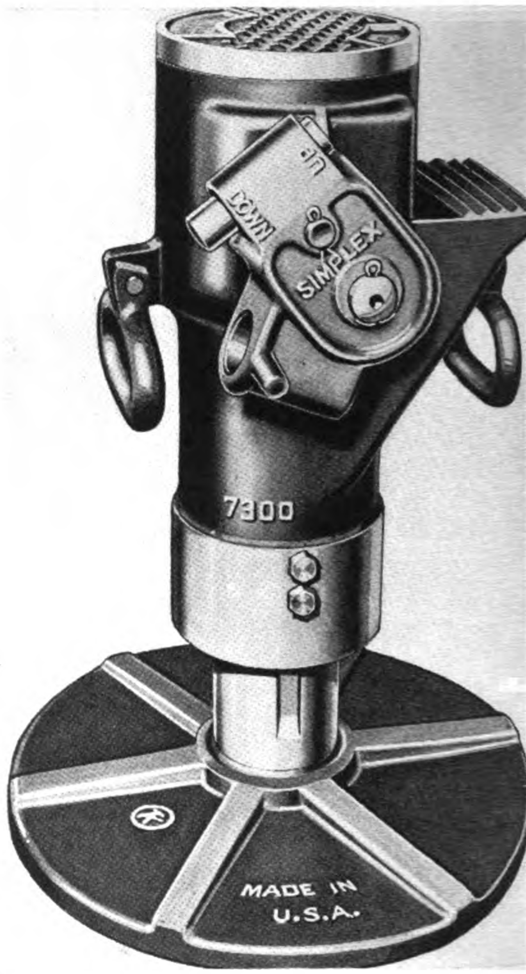
* * *



Portable a. c. Flexarc welders for railway shops provide a wide working range of 20 to 250 amp.—Current adjustment in any one of 27 steps is made by plugging into bayonet type receptacles—Built by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Speed Screw Jack

A 25-ton standard-speed, bevel-gear, ball-bearing screw jack is being manufactured by Templeton, Kenly & Co., Chicago. It is designed for heavy-duty lifting, lowering and skidding work. The jack has both toe and cap lift



A 25-ton jack which has a toe capacity of 12½ tons

arrangements, the toe lift being a minimum of 11 in. from the base in the standard model, although arrangements can be made to position the toe for special uses. The lifting capacity on the toe is 12½ tons and on the cap 25 tons. The operation of the jack is mechanical with a screw adjustment and enclosed ratchet mechanism.

Flame-Hardening Machine

A flame hardening machine is being manufactured by the Hydraulic Machinery, Inc., 10421 Grand River, Detroit, Mich., for the surface hardening of small parts. The base and external housing structures of the machine are of welded steel design. Electrical control and the use of hydraulic power provides positive and flexible operation. Parts of the machine which might require adjustment and routine maintenance are on the outside. The pilot light, burners and water coolant are located on the rear slide and are adjustable. This feature together with proper shielding directs the flame and the

(Continued on the next left-hand page)

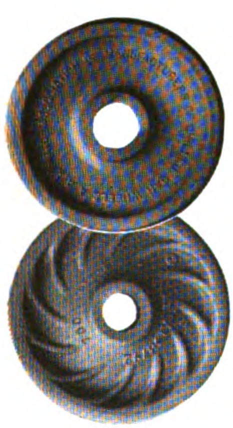
AMCCW INSPECTORS

ON GUARD

WITH THESE...

6 POSITIVE TESTS

SO EACH CHILLED WHEEL IS AS GOOD AS THE BEST



- Chill Test Block taken at least once in every ten wheels poured.
- One Complete Chemical Analysis Block with each heat.
- Constant Pyrometer checks for accurate process temperature.
- Drop Test of finished wheel (AAR specifications).
- Thermal Test of finished wheel (AAR specifications).
- Test for perfect rotundity.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

230 PARK AVENUE,
NEW YORK, N. Y.

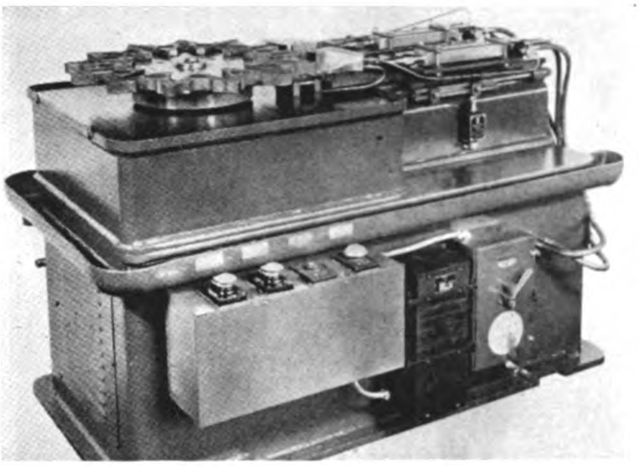
445 N. SACRAMENTO BLVD.,
CHICAGO, ILL.

AMCCW

ORGANIZED TO ACHIEVE:
Uniform Specifications
Uniform Inspection
Uniform Product

water to the exact surface desired and insures uniform results.

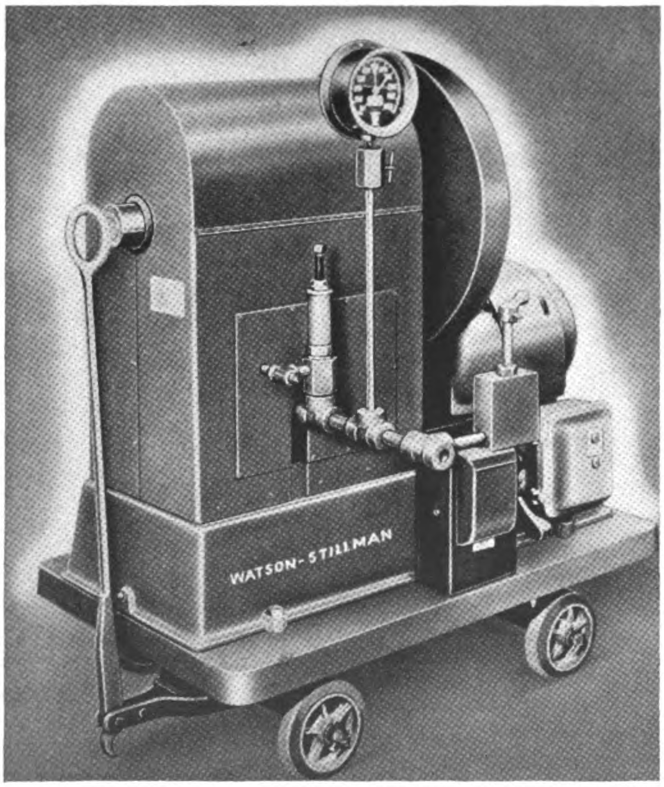
All working parts are adequately protected from the heat in the machine proper that might otherwise cause their distortion and misalignement. Water is used as a quenching medium and is sealed off from the actuating mechanism. The part to be hardened is manually loaded onto the index table of the machine, the pilot is positioned with a locating pin and after a starting button is pushed, the machine goes through its complete cycle of operation.



Flame-hardening machine for the surface hardening of small parts

Portable Test Pump

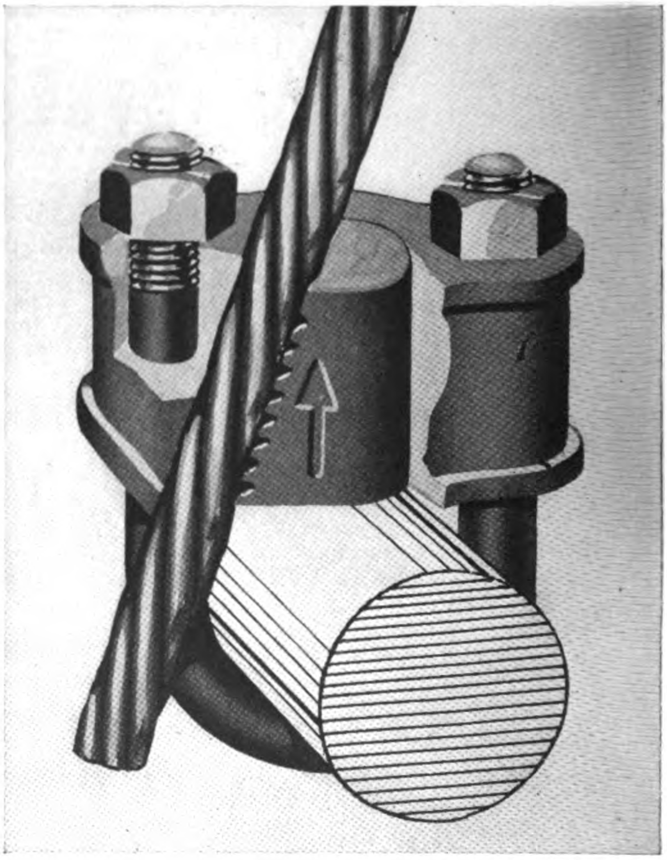
A motor-driven, portable test pump is being manufactured by the Watson-Stillman Co., Roselle, N. J., for use in testing boilers, tubing and high-pressure vessels. The entire unit, including the motor, is mounted on a hand truck and all parts are enclosed for protection against air-borne abrasives. The pump is a three-plunger, vertical type unit. The ½-in. diameter plungers have a 2-in. stroke. It is driven by a three horsepower motor at 100 r.p.m. and develops 8,200 lb. per sq. in. maximum pressure at ½ g.p.m. capacity. The equipment includes a pressure gage, a safety valve, a needle valve for pressure regulation, the motor, a motor starter and a disconecting switch. The entire unit is 50 in. long, 30 in. wide, 48 in. high and weighs 1,450 lb.



Portable test pump intended for use in testing boilers, tubing and high-pressure vessels

Brake Beam Safety Support Improved

The new type Universal brake beam safety support, developed by the Grip Nut Company, Chicago, and described in the February, 1942, *Railway Mechanical Engineer,* page 64, has been improved recently by two changes in design. Neither affects the fundamental operating principle of the device.

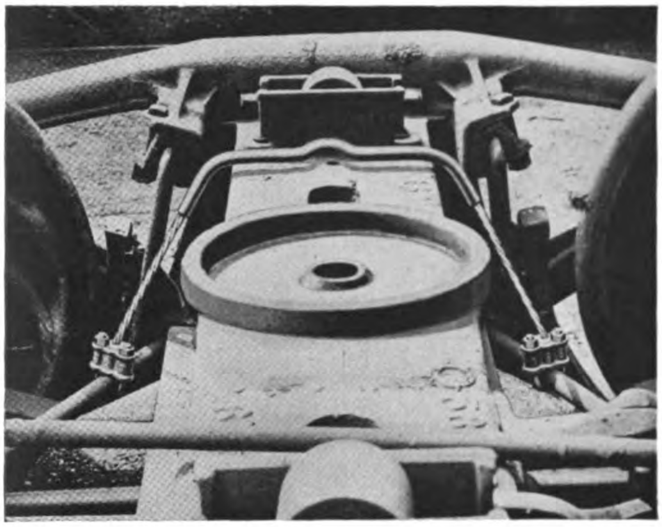


Malleable-iron fitting cut away to show how the cable is adjustable for length and held by a wedge insert

The Universal brake beam safety support is designed to prevent brake beams from dropping because of brake-hanger or brake-beam failure. It consists chiefly of two short lengths of double-galvanized cable per truck, connected to the brake-beam tension member by means of special iron fittings, and extending up to and over the truck bolster with about one inch clearance. The seven-

(*Continued on the next left-hand page*)

strand semi-rigid cable is protected by a short section of enclosing pipe where it passes over the bolster, and is held in place by a kink or hump. One of the improvements is to change this kink or hump from a vertical to a horizontal plane, giving increased clearance between the top of the support and the bottom of the body bolster.



Adjustable Universal brake beam safety support applied to a freight car truck

In the original design, the cable ends were fixed or anchored in the malleable-iron fittings by expanding the wires at each end and filling the taper pockets with molten zinc in accordance with customary practice. Experience developed that this fixed cable length required a number of different lengths to allow for the necessary clearance. With the new fittings, cables can be adjusted to the desired length and then anchored by means of wedge inserts. The entire assembly is held in place with Grip Unit nuts tightened on the U-bolts.

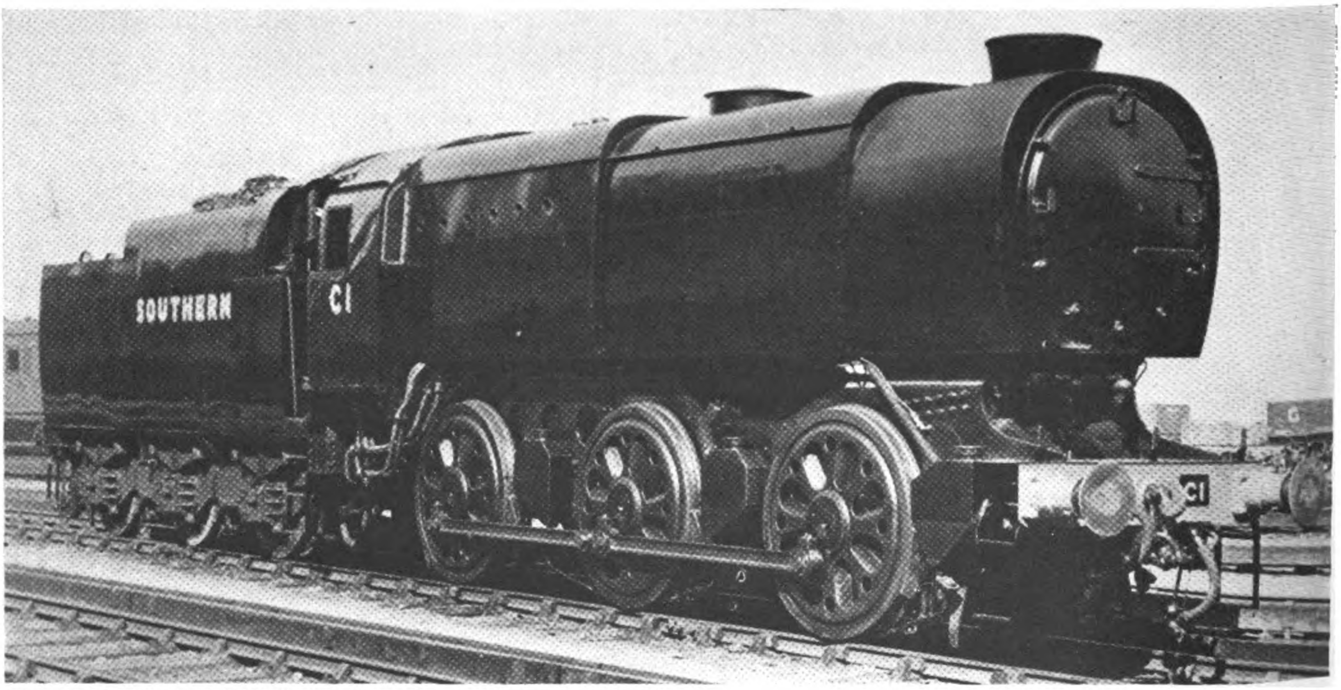
This device, which is an A. A. R. approved alternate standard can be fitted by easy adjustment to all types of freight car trucks, thus reducing the inventory of brake-beam safety supports which need be carried in stock. When renewing a brake beam, only one side of the support need be detached (R & R of four ½-in. nuts), which simplifies removal and replacement of the beam.

Side-Rod Bushings Machined With Alloy Tipped Tools

The machining of hard, sandy bronze side-rod bushings pierced with ⅜ in. lubricating holes was materially speeded by the use of Rexalloy tipped tools in one railroad shop, according to the Crucible Steel Company of America, New York, producers of these tools. Turning and facing operations, performed on an engine lathe, were done with an 11-in. travel at a speed of 150 surface feet per minute and a feed of 5/64 in. with a ½-in. square tool. The diameter of the bushing was 15 in. Previously, using high-speed steel tips, it had been necessary to regrind the tool during the operation; using Rexalloy the entire operation on the bushing was completed without the necessity of removing the tool from the holder.

Rexalloy tips have also been found to produce excellent results in both rough turning and finishing operations on manganese steels and on high-alloy tungsten steels.

* * *



Courtesy Southern Railway of England

The first of the "Austerity" class of mixed-traffic locomotives developed and built last Spring by the Southern Railway of England

No material has been wasted on trim. In the interests of accessibility to the valve motion and running gear, running boards and foot plates have been omitted. The enlarged smokebox permits removal of superheating elements and tubes without disturbing the steam pipes. The locomotive weighs 114,800 lb., all on the drivers. The tractive force is 30,000 lb.

(*Turn to next left-hand page*)

High Spots in
Railway Affairs . . .

Essential Jobs—Transportation

The War Manpower Commission has certified that the transportation service "is an activity essential to the support of the war effort." The National Headquarters of the Selective Service System in its Bulletin No. 21 lists 116 railroad occupations—including express and forwarding services—that require "a reasonable degree of training, qualification or skill to perform the duties involved." The list is said to be restricted to occupations requiring six months or more of training and preparation. Local selective service boards in classifying registrants are asked to give consideration to: (a) The training, qualification, or skill required for the proper discharge of the duties involved in his occupation; (b) the training, qualification, or skill of the registrant to engage in his occupation; (c) the availability of persons with his qualification to replace the registrant and the time in which replacement can be made.

The Army Leases Alaskan Railroad

The Alaskan-Canadian military highway, which is under construction by the United States Corps of Engineers, is expected to be completed for military use by December 1. The White Pass & Yukon, a short line railway, will afford a rail connection from the highway, which passes through Whitehorse, Yukon Territory, Canada, a terminus of the railroad, to Skagway, Alaska, on the coast. This railroad has been leased by the United States Army for the duration and is already being operated by the Military Railway Service, with Major John E. Ausland, Corps of Engineers, in charge. Brig. Gen. Carl R. Gray, Jr., general manager of the Military Railway Service, with headquarters at St. Paul, Minn., said at a meeting of the Western Railway Club that operating difficulties are intensified during the winter months by temperatures as low as 72 deg. F. below zero and virtually continual gales of 35 miles an hour.

Stop Accidents—A Useless Waste

The Union Pacific has received a high and well merited tribute for its consistent low accident record in a "Report on Railroad Employee Accident Statistics," recently made by the Bureau of Transport Economics and Bureau of Safety of the Interstate Commerce Commission. A study of the Union Pacific files, the report said, indicated that "the low casualty rate on this railroad is due to an energetic policy of accident prevention which pervaded the entire organization, from general officers to section laborers." President W. M. Jeffers of that system has recently made an appeal by letter to all superintendents of schools in states traversed by it to enlist the school children in a "Stay Away from the Tracks" campaign. Specific instances are cited of serious damage done by thoughtless actions of children. "It is tragic, yes, unpatriotic," said President Jeffers, "at a time when the nation's railroads, and the thousands of men and women employed by them, are bending every effort to help win the war, that they and the entire country's war program should suffer serious setbacks through pranks of children." He suggests that every child be enlisted in the campaign "under an oath of honor."

Labor Union-Management Co-operative Committee

Director Eastman of the Office of Defense Transportation has emphasized that "among the lessons which war has taught us is that management and labor have a mutual interest in solving problems incident to the war effort." He has appointed a permanent joint committee of railroad officers and labor union leaders to function under ODT auspices. The functions of the committee will be to call attention to matters involving the railroads and their employees which may concern ODT; consultation with ODT on policies and activities which are of interest to employees and management; and enlisting the co-operation of employees, management, and their organizations for efficient and economic utilization of all transportation facilities for the duration of the war.

Women Workers In Unusual Jobs

In speaking before the annual meeting of the American Railway Magazine Editors William Edward Hayes of the Information Division of the ODT said that large numbers of women must be used on the railroads during the emergency. A preliminary list that had been prepared included car cleaners in coach and freight yards, cleaners in stations and offices, clerks of all sorts with the exception of yard clerks, claim investigators, crossing watchmen or crossing flagmen, information bureau attendants, photographers, photostatic operators, telephoners, telegraphers, ticket examiners, ticket collectors, timekeepers, crew dispatchers, engine dispatchers, dining car employees, riveters, station agents, steam hammer operators, switch tenders and welders.

Oil Shipments Are Slowed Up

For the week ending October 10, the latest for which records were available when this was written, the daily average of tank car shipments to the East Coast was only 766,410 barrels. This is the lowest for any week since July 18. The railroads were not responsible for this falling off. According to an OPC announcement there was an unavoidable 24-hour delay in the return of between 1,800 and 2,000 empty tank cars to the West for reloading, because of a traffic congestion on a particular railroad, which was handling special movements; tank cars were also transferred from petroleum service to the vegetable oil and related services, and this will probably be continued under a WPB priorities directive; it is also possible that cars of less than 7,000 gal. capacity, removed from East Coast service by ODT order, may not have been replaced by larger cars.

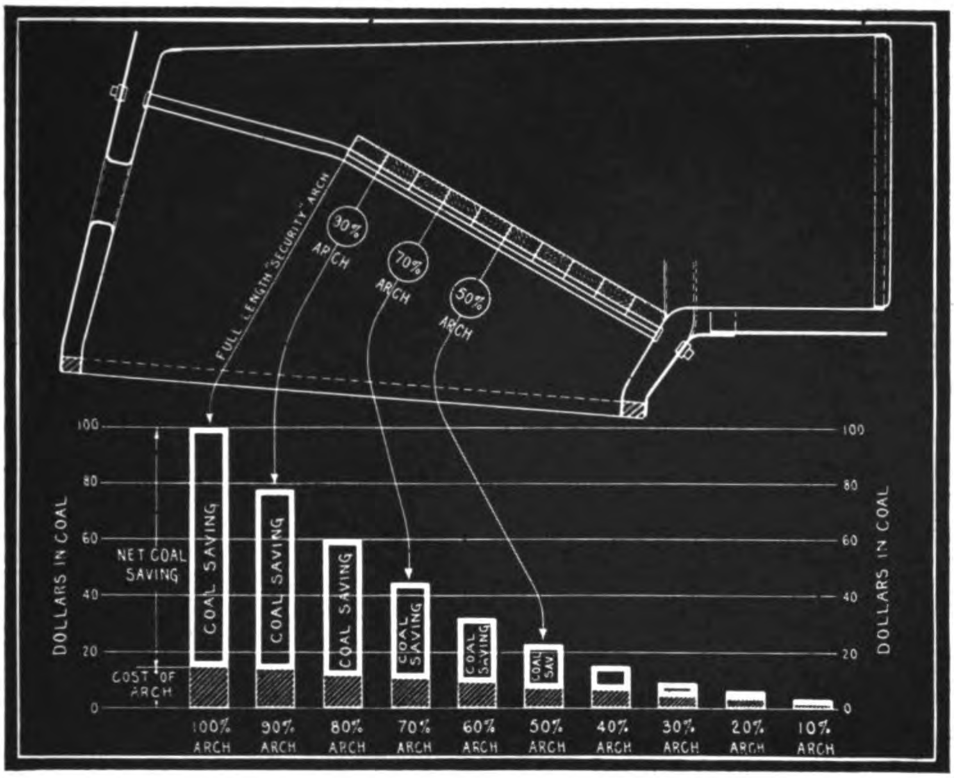
Loss and Damage Up

Payments for loss and damage to freight are increasing at a faster rate than freight revenues. This is unfortunate, particularly at a time when we can so ill afford to waste either transportation or commodities. Reports from 128 railroads in the United States and Canada show that the payments for the first six months of 1942 amounted to $15,572,717, as compared to $10,636,850 for a like period last year; this is an increase of $4,935,867, or 46.4 per cent. The rate of loss and damage payments to revenues of United States carriers increased from 0.51 per cent for the first six months of last year to 0.56 per cent for the first half of this year.

Railroaders Buy Bonds

In a "Railroad Edition" of its monthly publication, Payroll Savings News, the United States Treasury Department's war savings staff says that the American railroads, with more than a million and a half employees and a monthly payroll of about $270,000,000 are "headed full speed toward the goal" of 10 per cent War Savings Bonds subscriptions under the payroll deduction plan. Special mention is made of the methods used on the Boston & Maine, the first railroad with more than 300 employees to report subscriptions amounting to 10 per cent of the payroll. Daily reports were required from each sub-committee. This made it possible to send out system reports so that each craft and each division could currently compare its record with others. Stragglers and employees at outlying points whose duties made it difficult for them to attend meetings were rounded up by using a motor track inspection car.

(Turn to next left-hand page)



THE EFFECT OF ABBREVIATED ARCHES ON FUEL SAVING

FUEL CONSERVATION...

a wartime need!

Fuel wastage is a two-fold loss; the fuel itself and the transportation necessary to haul it. Because of the strategic importance of fuel to the war program every effort must be made to conserve this vital material.

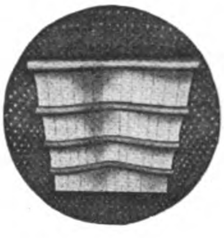
The fuel economy of Security Sectional Arches has been thoroughly proved in over 32 years of service on American railroads. But only a *complete* Arch can produce maximum fuel savings.

You need a full Arch for full fuel economy.

THERE'S MORE TO SECURITY ARCHES THAN JUST BRICK

HARBISON-WALKER REFRACTORIES CO.

Refractory Specialists



AMERICAN ARCH CO.
INCORPORATED
60 EAST 42nd STREET, NEW YORK, N. Y.

Locomotive Combustion Specialists

Among the Clubs and Associations

Northwest Car Men's Association.—Meeting held November 2. Speaker: A. T. Cox, Jr., Lincoln Electric Railway Sales Co., Chicago. Subject: Electric arc welding and its value to the railroads.

Eastern Car Foremen's Association.—Meeting 8 p. m., November 13, 29 West Thirty-ninth street, New York. Speaker: James A. Shafer, National Malleable & Steel Castings Company, Cleveland, Ohio. Subject: High-Speed Freight-Car Trucks.

Car Foremen's Association of Chicago.—At the annual meeting and smoker of the Car Foremen's Association of Chicago on Monday evening, October 12, the following officers were elected to direct the activities of the association during the coming year: President, H. B. Atherton, car foreman, Chicago Great Western, Chicago; first vice-president, W. J. Burns, mechanical inspector, General American Transportation Corporation, Chicago; second vice-president, J. Krupka, car foreman, Chicago, Burlington & Quincy, Chicago. G. K. Oliver, assistant passenger car foreman, Baltimore & Ohio Chicago Terminal, was re-elected secretary and C. J. Nelson, superintendent, Chicago Car Interchange Bureau, was re-elected treasurer.

A. S. M. E. Annual Meeting

War production and man power are the main topics for discussion at the sixty-third annual meeting of the American Society of Mechanical Engineers to be held at the Hotel Astor, New York, November 30 to December 4. "Planned Conservation of Railroad Mechanical Manpower" is the theme of the Railroad Division sessions, at which the Hon. Paul V. McNutt, chairman, War Manpower Commission, Washington, D. C., will be a speaker. A report on Diesel locomotive progress under war conditions has also been prepared for presentation at a joint session of the Oil and Gas Power and Railroad Divisions. The programs for these sessions, also the session on Mechanical Springs, are as follows:

Wednesday, December 2
2 p. m.
Oil and Gas Power—Railroad

Diesel Locomotive Progress Report Under War Conditions

Speakers:
Paul Turner, eastern regional manager, Electro Motive Corporation.
Max Essl, chief engineer, Diesel Division, Baldwin Locomotive Works.
P. H. Hatch, assistant mechanical engineer, New York, New Haven & Hartford.
Wayne E. Lynch, American Locomotive Company, and General Electric Company.
W. S. H. Hamilton, equipment electrical engineer, New York Central System.
A. K. Galloway, general superintendent motive power and equipment, Baltimore & Ohio.

Progress Report on Gas Turbine Locomotive Operation, by Paul R. Sidler, resident engineer, Brown, Boveri & Co., Ltd.

Future Diesel Locomotive Possibilities, by P. B. Jackson, Aluminum Company of America.

7 p. m.
A. S. M. E. banquet.

Thursday, December 3
9:30 a. m.
Railroad—I

Planned Conservation of Railroad Mechanical Manpower

Speakers:
Hon. Paul V. McNutt, chairman, War Manpower Commission, Washington, D. C.
F. K. Mitchell, assistant general superintendent motive power and rolling stock, New York Central.
Otto S. Beyer, chief, Personnel Section, Office Defense Transportation.
Dr. A. C. Willard, president, University of Illinois.
Col. Jas. L. Walsh, chairman, War Production Committee, A. S. M. E.

12:30 p. m.
Luncheon.

2 p. m.
Railroad—II

Planned Conservation of Railroad Mechanical Manpower (Continued)

Speakers:
Harold V. Coes, president, A. S. M. E.
Dorothy Sells, assistant chief, Personnel Section, Office Defense Transportation.
Charles E. Brinley, president, Baldwin Locomotive Works.
Brig. Gen. Julian S. Hatcher, chief, Military Training Branch, Ordnance Dept., United States Army.

Discussion by leading governmental, railroad, and industrial executives.

Mechanical Springs

Volute-Spring Formulas, by C. J. Holland, president, Holland Co., Chicago.

The Testing of Volute Springs, by Bernhard Sterne, experimental engineer, Chrysler Corporation, Detroit, Mich.

Notes on Secondary Stresses in Volute Springs, by Henry O. Fuchs, engineer, General Motors Corporation, Detroit, Mich.

DIRECTORY

The following list gives names of secretaries, dates of next regular meetings, and places of meetings of mechanical associations and railroad clubs:

Allied Railway Supply Association.—J. F. Gettrust, P. O. Box 5522, Chicago.

American Society of Mechanical Engineers.—C. E. Davies, 29 West Thirty-ninth street, New York. Annual meeting Hotel Astor, New York, December 1-5.
Railroad Division. — E. L. Woodward, *Railway Mechanical Engineer*, 105 West Adams street, Chicago.

Anthracite Valley Car Foremen's Assn.—Victor H. Deppe, general secretary, Mountain Top, Pa. Meets third Monday of each month at Wilkes-Barre, Pa.

Association of American Railroads.—Charles H. Buford, vice-president Operations and Maintenance Department, Transportation Building, Washington, D. C.
Operating Section.—J. C. Caviston, 30 Vesey street, New York.
Mechanical Division.—A. C. Browning, 59 East Van Buren street, Chicago.
Purchases and Stores Division.—W. J. Farrell, Executive Vice Chairman, Transportation Building, Washington, D. C.
Motor Transport Division.—George M. Campbell, Transportation Building, Washington, D. C.

Canadian Railway Club.—C. R. Crook, 4415 Marcil avenue, N. D. G., Montreal, Que. Regular meetings, second Monday of each month, except June, July and August, at Windsor Hotel, Montreal, Que.

Car Department Association of St. Louis.—J. J. Sheehan, 1101 Missouri Pacific Bldg., St. Louis, Mo. Regular monthly meetings third Tuesday of each month, except June, July and August, DeSoto Hotel, St. Louis.

Car Department Officers' Association.—Frank Kartheiser, chief clerk, Mechanical Dept. C. B. & Q., Chicago.

Car Foremen's Association of Chicago.—G. K. Oliver, 8238 S. Campbell avenue, Chicago. Regular meetings, second Monday in each month, except June, July and August, La Salle Hotel, Chicago.

Car Foremen's Association of Omaha, Council Bluffs and South Omaha Interchange.—H. E. Moran, Chicago Great Western, Council Bluffs, Ia. Regular meetings, second Thursday of each month.

Central Railway Club of Buffalo.—Mrs. M. D. Reed, Room 1840-2, Hotel Statler, Buffalo, N. Y. Regular meetings, second Thursday of each month, except June, July and August, at Hotel Statler, Buffalo.

Eastern Car Foremen's Association.—W. P. Dizard, 30 Church street, New York. Regular meetings, second Friday of January, February (annual dinner), March, April, May, October, and November at Engineering Societies Bldg., 29 West Thirty-ninth street, New York.

Indianapolis Car Inspection Association.—H. T. Bramblett, care of H. P. Ruck, car foreman, Pennsylvania, 764 South Emerson avenue, Indianapolis, Ind. Regular meetings, first Monday of each month, except July, August and September, in Indianapolis Union Station, Indianapolis, at 7 p. m.

Locomotive Maintenance Officers' Association.—Secretary-treasurer C. M. Lipscomb, Missouri Pacific, North Little Rock, Ark.

Master Boiler Makers' Association.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

Midwest Air Brake Club.—C. F. Davidson, secretary-treasurer, general inspector car department, St. L.-S. F., Springfield, Mo.

New England Railroad Club.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meetings second Tuesday in each month, except June, July, August and September, at Hotel Touraine, Boston, Mass.

New York Railroad Club.—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Thursday in each month, except June, July, August, September and December at 29 West Thirty-ninth street, New York.

Northwest Car Men's Association.—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meetings first Monday each month, except June, July and August, at Midway Club rooms, 1931 University avenue, St. Paul.

Northwest Locomotive Association.—G. T. Gardell, 820 North Pacific Building, St. Paul, Minn. Meetings third Monday of each month, except June, July and August.

Pacific Railway Club.—William S. Wollner, P. O. Box A, Sausalito, Calif. Regular meetings, second Thursday of each alternate month at Palace Hotel, San Francisco, Calif., and Hotel Hayward, Los Angeles.

Railway Club of Pittsburgh.—J. D. Conway, 308 Keenan Building, Pittsburgh, Pa. Regular meetings, fourth Thursday in month except June, July and August, Fort Pitt Hotel, Pittsburgh, Pa.

Railway Fuel and Traveling Engineers' Association.—T. Duff Smith, Room 811, Utilities Building, 327 South La Salle street, Chicago.

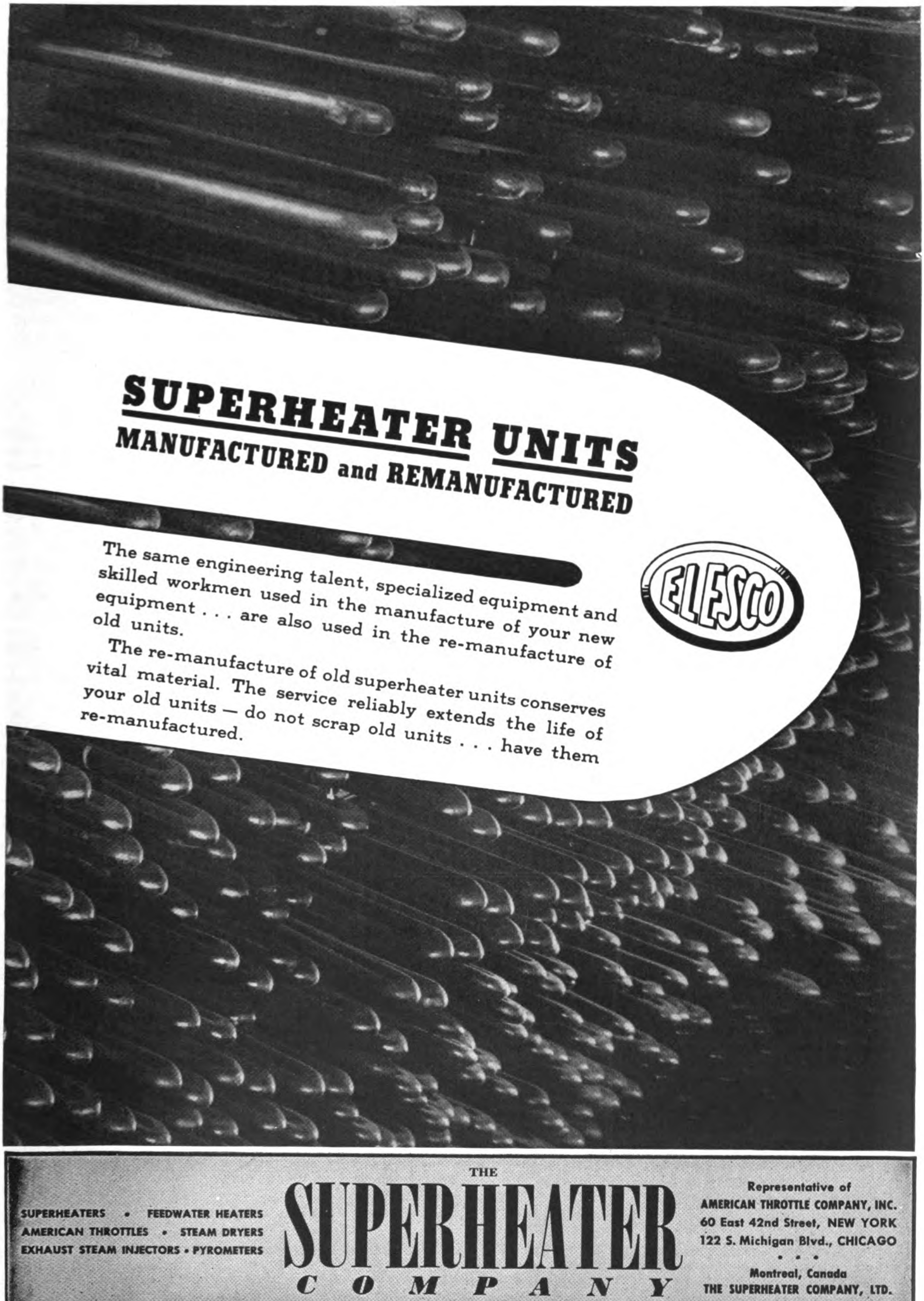
Railway Supply Manufacturers' Association.—J. D. Conway, 308 Keenan Building, Pittsburgh, Pa.

Southern and Southwestern Railway Club.—A. T. Miller, 4 Hunter St., S. E., Atlanta, Ga. Regular meetings, third Thursday in January, March, May, July and September. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

Toronto Railway Club.—D. M. George, Box 8, Terminal A, Toronto, Ont. Meetings, fourth Monday of each month, except June, July, and August at Royal York Hotel, Toronto.

Western Railway Club.—E. E. Thulin, executive secretary, 122 South Michigan avenue, Chicago. Regular meetings, third Monday in each month, except June, July, August, September, and January, Hotel Sherman.

(*Turn to next left-hand page*)


SUPERHEATER UNITS
MANUFACTURED and REMANUFACTURED
The same engineering talent, specialized equipment and skilled workmen used in the manufacture of your new equipment . . . are also used in the re-manufacture of old units.
The re-manufacture of old superheater units conserves vital material. The service reliably extends the life of your old units — do not scrap old units . . . have them re-manufactured.
ELESCO
SUPERHEATERS • FEEDWATER HEATERS
AMERICAN THROTTLES • STEAM DRYERS
EXHAUST STEAM INJECTORS • PYROMETERS
THE
SUPERHEATER
COMPANY
Representative of
AMERICAN THROTTLE COMPANY, INC.
60 East 42nd Street, NEW YORK
122 S. Michigan Blvd., CHICAGO
Montreal, Canada
THE SUPERHEATER COMPANY, LTD.

NEWS

Mechanical Division, A. A. R.

Letter Ballot Results

As a result of a favorable letter ballot, 11 specific recommendations for changes in the standards and recommended practices of the A. A. R. have been approved effective immediately. These recommendations include the following proposals: (1) to modify the braking ratio for freight cars; (2) to increase the dimension defining the maximum height of steam heat couplers above the center line, as shown on page E-78-1942 of the Manual; (3) to adopt new specifications M-914-brake cylinder lubricant; (4) to advance to standard the present recommended practice testing device for air brake hose couplings and instructions for its use, and make same mandatory for use in testing hose couplers before being mounted on hose; (5) to modify autogenous welding limits and regulations; (6) to modify the specifications for geared hand brakes; (7) to revise recommended practice designs of light-weight pistons; (8) to adopt standard brake shoes and wheels for use on Diesel-electric switching locomotives; (9) to modify Sec. 10(a) of the standard method of packing journal boxes; (10) to revise definitions and designating letters for tank cars; (11) to revise Sec. VI—marking of specifications M-123-41.

The first four propositions were advanced by the Committee on Brakes and Brake Equipment; Nos. 7 and 8 by the Committee on Locomotive Construction and each of the others by the particular committee interested. All propositions were approved by the General committee before being submitted to letter ballot in a circular dated September 5, 1942.

Inspection of New Cast-Iron Wheels

In a circular letter, recently issued by the Division, attention is called to A. A. R. Specification M-403-41 which covers cast-iron wheels for locomotives, tenders and cars, and provides that "In all cases where wheels are rejected for any reason, the letter 'R' must be chipped out of the 'A. A. R.'" With the modification in wheel markings recently placed in effect, which eliminates the purchaser's name, the above requirements assume increasing importance. The circular letter emphasizes the necessity of insisting that the letter "R" be chipped from rejected wheels in the presence of inspectors at the time of rejection, with the understanding that any violation of the requirement must be reported to the office of the secretary of the Mechanical Division. The purchaser's inspectors are held responsible for policing this provision.

Safety Support Rule Extended

The Division has recently taken action to extend by one year the effective date of Interchange Rule 3, Sec. (b), Par. (8), which provides that effective January 1, 1943, cars will not be accepted from the owner unless equipped with bottom-rod and brake-beam safety supports, A. A. R. recommended practice, or A. A. R. approved equivalent; and that, effective July 1, 1943, this provision will become a general interchange requirement. The Board of Directors of the association has given consideration to this rule and decided to extend the effective date for one year to January 1, 1944, with the understanding that car owners will co-operate to the end that all of their interchange freight cars will be fully equipped by that date.

ODT Appointments

H. S. Keppelman, superintendent car department of the Reading, with headquarters at Reading, Pa., has been granted a leave of absence to accept appointment as deputy associate in charge of freight and passenger car repairs of the Division of Railway Transport, Office of Defense Transportation.

J. E. Friend, master mechanic of the Western division of the Texas & Pacific at Ft. Worth, Tex., has been granted a leave of absence to serve as assistant to associate director, Office of Defense Transportation.

Equipment Purchasing and Modernization Programs

Canadian National.—A contract amounting to more than $20,000 has been awarded P. W. Graham & Sons, Moose Jaw, Sask., for reroofing 12 stalls, lengthening six stalls, and lengthening the engine pits in three stalls of the enginehouse at Biggar, Sask.

Delaware & Hudson.—The Delaware & Hudson has awarded a contract for extending 13 stalls of its enginehouse at Oneonta, N. Y., at an estimated cost of $60,000, to the Oneonta Contracting Company.

Erie.—The Erie has authorized the construction of a coupler repair shop at the scrap reclamation plant, Meadville, Pa., at a cost of approximately $20,000.

Grand Trunk Western.—Company forces are engaged in work at the car shops of the Grand Trunk Western at Port Huron, Mich., which will cost approximately $39,000. The work consists of the removal of a timber roof and monitors, including timber posts, and replacement with a new timber roof supported on second-hand steel roof trusses. The new construction will provide a clear span of 80 ft. between exterior walls for a length of 360 ft. adjoining the new steel freight car shop rebuilt in 1935.

The Missouri Pacific.—The Missouri Pacific has been authorized by the District Court to recondition 50 steel box cars for use as baggage cars for troop movements.

New York Central.—This company has awarded a contract for the reconstruction of stalls 11 to 22 of its enginehouse at Gardenville, N. Y., to the John W. Cowper Co., Inc., of Buffalo, N. Y.

New York, New Haven & Hartford.—The Interstate Commerce Commission, Division 4, has authorized the N. Y., N. H. & H. to assume liability for $1,390,000 of two per cent equipment trust certificates to be sold at 98.559 per cent of par and accrued dividends to Halsey, Stuart & Company, Inc. The certificates will mature in 10 equal annual installments of $139,000 each on October 1 of each year from 1943 to 1952, and the proceeds will be used to finance in part the acquisition of ten 2,000-hp. Diesel-electric "A" unit passenger and freight locomotives, costing an estimated total $1,738,940.

Texas Mexican.—This road is constructing an engine house and shop 40 ft. by 100 ft. by 22 ft. high, of concrete and second hand brick at Corpus Christi, Tex. The enginehouse will have a drop pit and will be equipped to make light repairs.

Union Pacific.—The Union Pacific has awarded a contract amounting to about $31,000 to the F. W. Miller Heating Company for the installation of direct steaming equipment in the enginehouse at Green River, Wyo. The work covers the installation of special heat exchangers and necessary pipe in the blowdown and fill-up lines, using live steam from the power plant to raise the temperature of fill-up water to 230 to 340 deg. F., depending upon the velocity of the water supply and the pressure of steam.

Wabash.—This company has asked the Interstate Commerce Commission for authority to assume liability for the $2,000,000 equipment trust certificates mentioned in the September *Railway Mechanical Engineer*, page 402, the proceeds of the issue to be used as a part of the purchase price of the equipment therein mentioned.

The Western Pacific.—The Western Pacific has received authorization from the United States district court at San Francisco, Calif., for the purchase of nine locomotives, to help haul the railroad's heavy war load, at an approximate cost of $2,800,000. Three of the new motive power units will be Diesel-electric main-line engines of 5,400 hp. each, to be built by the Electro-Motive Corporation at cost of $506,350 each, or a total of $1,519,050. The remaining six will be steam freight locomotives of 4-8-4 wheel arrangement, to be built by the Lima Locomotive Works at cost of $210,530 each, or a total of $1,263,180. Delivery of the new locomotive power is expected during the first six months of 1943. The railroad's application for purchase authority stated that funds on hand would be used to make an initial payment of $695,558 or 25 per cent of the total cost, with the balance to be covered by the sale of equipment notes.

"Movie" Shows Turret-Lathe Operation

The Gisholt Machine Company, Madison, Wis., has completed a sound and color motion picture, "Turret Lathes—Their Operation and Use," which is designed to aid in training new machine shop employees. The subject matter covered includes a comparison of the turret lathe with other metal-working machines and detailed sequences illustrating the basic types of work done on a turret lathe and the production methods followed in each case. The film is of the 16 mm. size.

Railway and Supply Men Win Welding Awards

Twenty-two engineers, designers, supervisors and welders of railroads and supply companies are the winners of 18 awards in the $200,000 Industrial Progress Award Program which the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio, has been conducting during the last 2½ years. All together 408 awards were made to 458 recipients who submitted reports of welding progess.

Some of the winners of awards in the field of railway motive power and rolling stock, the amounts, and the subjects of their papers are as follows:

J. E. Candlin, Jr., assistant engineer and A. M. Unger, plant engineer, of the Pullman-Standard Car Manufacturing Company, Chicago, $3,700. Major consideration in the applications of welding to railroad passenger cars since 1936.

H. Malcolm Priest, engineer of the U. S. Steel Corporation subsidiaries, Pittsburgh, Pa., $2,700. Welding 250-ton flat cars.

John H. Hruska, chief inspector of the Electro-Motive Division of General Motors Corporation, La Grange, Ill., $1,700. Problems in the construction of an all-welded 5,400 H. P. Diesel-electric freight locomotive.

John F. Muller, sales engineer and Gonzalo C. Munoz, secretary-treasurer, of the American Pulley Company, Philadelphia, Pa., $1,300. A method of suspending the compressor of a railroad car air-conditioning system.

Cyril Henry Easun, assistant mechanical engineer, Shop Methods, Central region of the Canadian National, Toronto, Ont., $700. Tire failures on fast passenger and freight locomotives.

Paul E. McKamy, industrial locomotive designer of the Whitcomb Locomotive Company, Rochelle, Ill., $500. The substitution of an all-welded locomotive truck frame for a steel casting.

John Dewar Seivewright, welding supervisor of the Central region of the Canadian National, Toronto, Ont., $500. Railroad brake shoe castings.

Carl Ray Averitt, assistant blacksmith foreman of the Illinois Central, Paducah Shops, Paducah, Ky., $500. Fabrication of a steam locomotive cylinder.

Walter E. Barron, foreman in charge of welding of the Heisler Locomotive Works, Erie Pa., $250. The construction of a "fireless" locomotive.

Clifford A. Salk, carman and Ray F. Theisen, welder of the Great Northern, St. Cloud Shops, St. Cloud, Minn., $250. The conversion of tenders into tank cars.

John P. Roger, plant engineer of the Babcock and Wilcox Company, Barberton, Ohio, $150. Welding applications to parts of a locomotive boiler.

Jesse F. Holloway, designer of the Car, Truck and Diesel Locomotive division of the Baldwin Locomotive Works, Eddystone, Pa., $100.

J. J. Laudig, research engineer of the Delaware, Lackawanna & Western, Scranton, Pa., $100.

Supply Trade Notes

D. L. Immel has been promoted to assistant plant superintendent at the Warren, Ohio, plant of the Copperweld Steel Company.

◆

Tubular Products, Inc., a subsidiary of the United States Steel Corporation, has changed its name to Tubular Alloy Steel Corporation to "more truly reflect the emphasis which will be given to the production of tubular alloy steel products."

◆

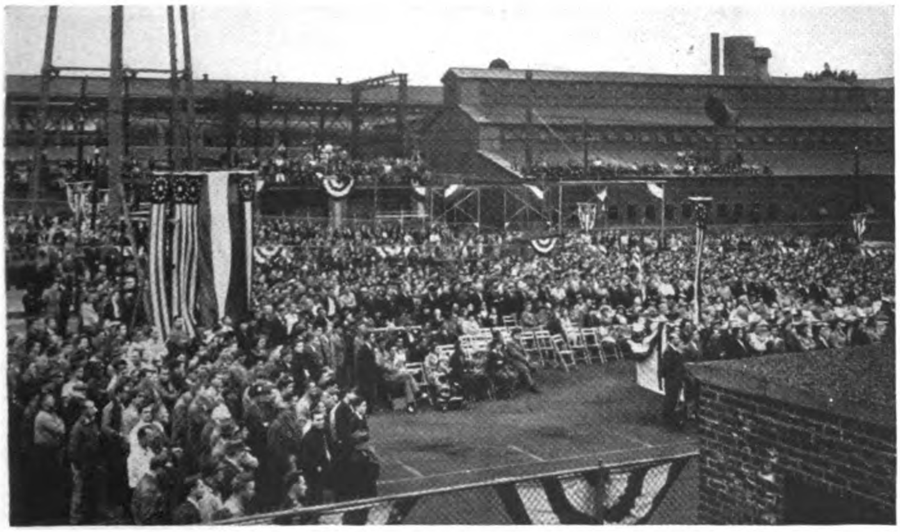
R. L. Salter, engineer of tests of the Association of Manufacturers of Chilled Car Wheels, with headquarters at Chicago, has resigned to enter the employ of the Southern Wheel division of the American Brake Shoe & Foundry Co., at New York.

Metal & Thermit Corporation.—*Merritt L. Smith,* advertising manager of the Metal & Thermit Corporation, has been appointed also assistant sales manager, with headquarters at 120 Broadway, New York. *Charles D. Young,* formerly district manager at Chicago, has been appointed sales manager of the welding division, with headquarters at New York.

◆

Whiting Corporation.—*Howard D. Grant,* executive vice-president of the Whiting Corporation, Harvey, Ill., has been elected president to succeed *Thomas S. Hammond,* who is now in charge of the Chicago district ordnance staff and has been succeeded by *Stevens H. Hammond,* vice-president, as executive vice-president and chief of the executive staff.

* * *



Employees of the Bullard Company gathered at Bridgeport, Conn., on October 13 to present to the U. S. Army Air Forces a Republic P-47 fighting plane—"The Bullard Thunderbolt"—the fund for which they had collected among themselves

E. P. Barry has been appointed co-ordinator of plants of the Chicago Pneumatic Tool Company. Mr. Barry will supervise machine equipment, tool designing, and production methods for the company's plants at Detroit, Mich.; Cleveland, Ohio, Franklin, Pa., and Garfield, N. J.

◆

Pittsburgh Steel Company.—*Henry A. Roemer, Jr.,* formerly manager of sales of steel and wire products for the Pittsburgh Steel Company, has been appointed assistant general manager of sales. *Norman F. Melville,* formerly assistant manager of sales of steel and wire products, has been appointed manager of sales of that department to succeed Mr. Roemer.

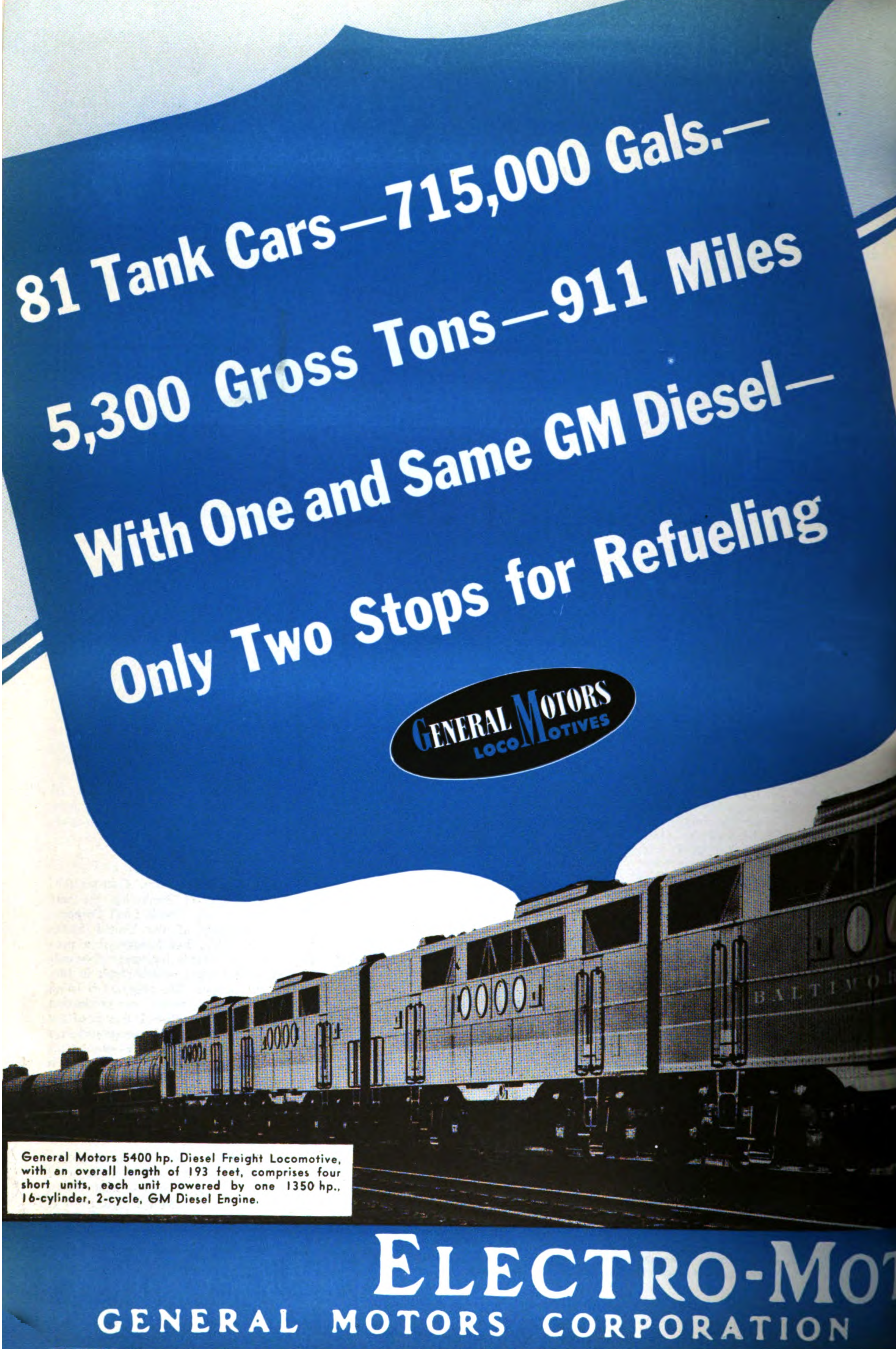
◆

Carnegie-Illinois Steel Corporation.—In the interest of furthering the war effort, the Carnegie-Illinois Steel Corporation, a subsidiary of the United States Steel Corporation, has announced a program of cash awards for suggestions advanced by employees, which result in furthering production. The program is being conducted by the various war-production drive committees established in each of the Carnegie-Illinois plants. Suggestions boxes have been provided by the committees throughout the mills and offices into which all suggestions are to be deposited. For each suggestion accepted, the employee will receive an award of $10.

◆

George M. Cooper has been transferred to the western sales department of the Brake Shoe and Castings and Wheel division of the American Brake Shoe & Foundry Co., with headquarters at Houston, Texas. He began his career with the American Brake Shoe & Foundry Co. in

(*Continued on second left-hand page*)



General Motors 5400 hp. Diesel Freight Locomotive, with an overall length of 193 feet, comprises four short units, each unit powered by one 1350 hp., 16-cylinder, 2-cycle, GM Diesel Engine.

1918 as an office boy in the Ramapo Iron Works, now a part of the Ramapo Ajax division. From January, 1921, to December, 1922, he was secretary to the president of the Ramapo company. In December, 1922, he was transferred to the export department, where he served until April, 1925. Mr. Cooper was then transferred to the sales department, where he remained until his recent transfer.

◆

CHARLES RIDDELL.—The Baldwin Locomotive Works and subsidiary companies had 100 guests, principally railroad and railway supply men, at a dinner at the Chicago Club in Chicago on the evening of October 12 to do honor to Charles Riddell, district manager at Chicago of these companies, in celebration of his completion of 60 years in their service. Charles E. Brinley, president of Baldwin, presided.

Mr. Riddell entered the service of the Standard Steel Works, a subsidiary of Baldwin, as an office boy in Philadelphia on October 12, 1882, when 15 years old. From 1896 to 1904 he was Chicago manager of the Standard Steel Works, and since 1904 has been district manager of Baldwin and all subsidiaries. He is still in vigorous health, and Mr. Brinley announced that he will continue as district manager.

◆

GEORGE J. WEBER, secretary and executive assistant to the president of the Association of Manufacturers of Chilled Car Wheels, has been appointed engineer of tests, with headquarters at Chicago. Mr.

George J. Weber

Weber entered the employ of the Griffin Wheel Company in 1905 and served as chief inspector and a member of the general operating staff for specialized services, including the operation of foundries. He joined the staff of the Association of Manufacturers of Chilled Car Wheels as secretary in 1934 and in 1936 became also executive assistant to the president.

◆

CHARLES H. McCREA, who has been elected president of the National Malleable and Steel Castings Company, as noted in the October issue, is 52 years of age. He was graduated from Purdue University with a degree in civil engineering in 1912 and began his business career in the engineering department of the Pennsylvania during college vacations and for three months after graduation. He was employed in the construction department of the Erie from September, 1912, to February, 1913, when he joined the National Malleable and Steel Castings Company as a special engineer in the Toledo, Ohio, works. From September, 1914, to April, 1916, he was a service engineer in the company's Cleveland, Ohio, Sharon, Pa., and Chicago offices and from April, 1916, to June, 1917, was a salesman at the St. Louis, Mo., office. He served as a captain in the United States army from June, 1917, to January, 1920, when he returned to the National Malleable and Steel Castings Company as manager of the St.

Charles H. McCrea

Louis office. From June, 1922, to October, 1923, he was engaged in sales work in Germany, France, Belgium, England, India, New Zealand and Australia. Mr. McCrea was appointed manager of the St. Louis office in October, 1923, sales manager of the Cleveland works in January, 1931, and manager of the Cleveland works in January, 1938. He became first vice-president and director of the company in May, 1942.

Army-Navy Production Awards

American Brake Shoe and Foundry Co., American Forge division. October 24.

American Rolling Mill Company, Middletown, Ohio. All divisions. October 5.

Edgewater Steel Company, Oakmont, Pa. October 1.

The Ex-Cell-O Corporation, Detroit, Mich. September 11.

The Flannery Bolt Company, Bridgeville, Pa. October 9.

General Steel Castings Corporation, Granite City, Ill., and Eddystone, Pa. October 1.

Independent Pneumatic Tool Company, Aurora, Ill. October 8.

The International Nickel Company, Huntington, W. Va. Awarded for third time.

Revere Copper and Brass, Inc., Dallas division, Chicago. October 7.

Timken-Detroit Axle Company, Detroit, Mich.; Waukegan, Ill.; Oshkosh, Wis. September 10 and 12.

Westinghouse Electric & Manufacturing Co. Five plants in Pittsburgh, Pa., area.

Obituary

ROY HUNTER, direct sales representative in the northern Ohio and western Pennsylvania area for the Gisholt Machine Company, Madison, Wis., died September 12 at the age of 54.

◆

FRANK E. BLANCHARD, sales engineer in the engine department of the Caterpillar Tractor Company, Peoria, Ill., died suddenly at Peoria on September 14. He was 54 years of age.

◆

C. D. HILFERTY, who retired in March, 1941, as librarian and special research engineer of the Superheater Company, died on September 26. Mr. Hilferty was 73 years of age. He had served as head draftsman at the Schenectady, N. Y., plant of the American Locomotive Company, where he designed the first locomotive piston valve, and later was employed on the Michigan Central. He was also formerly with Cooke Works in Paterson, N. Y., as resident inspector, and for three years was chief inspector at a plant of the American British Manufacturing Company in Bridgeport, Conn. He joined the Superheater Company in November, 1910, and after serving for five years as service engineer was transferred to engineering duties in the New York office. From 1921 until his retirement in 1941, he was librarian and special research engineer.

◆

GEORGE C. ISBESTER, railroad sales manager of the Yale & Towne Mfg. Company,

George C. Isbester

died on October 10. Mr. Isbester was born at Niagara Falls, N. Y., on June 9, 1878. He entered the railway field in 1899 in the mechanical department of the Great Northern and from 1908 to 1913 was in charge of the Chicago office of the Q. & C. Co. In 1917 he entered the Navy as a captain. He served as aide to Admiral Moffett at Great Lakes, Ill., and later to Admiral Sims at London, England. After the war, he was associated with the American Chain Company and the Brown-Isbester Company. In 1933, he became railroad sales manager of Yale & Towne Mfg. Co.

ALBERT E. CRONE, vice-president and general manager, with headquarters at Lackawanna, N. Y., for the Buffalo Brake Beam Company of New York, died in Buffalo, N. Y., on October 18. He was 70 years of age.

◆

R. W. BURNETT, president of the Ajax Hand Brake Company, Chicago, died in that city on October 13. Mr. Burnett was born at Farmer City, Ill., in 1868 and entered railway service in 1890 in the car department of the Union Pacific at Denver, Colo. In 1892, he entered the employ of the Pennsylvania as a car inspector at Chicago, and from August, 1892, to July, 1899, was successively foreman and general foreman of the car department of the Lake Shore & Michigan Southern (now N. Y. C.) at Chicago. During the early part of 1900 he was general foreman of the car

R. W. Burnett

department of the Long Island, and in the latter part of the year was general foreman of the car department of the Central of New Jersey at Elizabeth, N. J. From 1904 to January, 1907, he was successively assistant master car builder and master car builder of the Erie at Meadville, Pa. On the latter date he became assistant master car builder of the Canadian Pacific. He was appointed general master car builder in 1909 and resigned in 1915 to become vice-president of the National Car Equipment Company. He returned to railway service on September 1, 1917, as master car builder of the Delaware & Hudson and in 1919 resigned to become assistant to the general manager of the Joliet Railway Supply Company and vice-president of the National Car Equipment Company, with headquarters at Chicago. In 1926, he became president of the Ajax Hand Brake Company.

Personal Mention

General

R. E. LEE has been appointed assistant mechanical engineer of the Seaboard Air Line at Norfolk, Va.

A. J. FERENTZ, superintendent car department of the Lehigh Valley at Bethlehem, Pa., has been appointed assistant superintendent at Wilkes-Barre, Pa.

EDWARD H. ROY, night enginehouse foreman of the Norfolk Southern at Raleigh, N. C., has been appointed chief mechanical inspector, with headquarters at Norfolk, Va.

J. P. STEWART, general supervisor of air brakes of the Missouri Pacific at St. Louis, Mo., retired on September 30.

W. R. SUGG, superintendent of fuel conservation and lubrication of the Missouri Pacific, with headquarters at St. Louis, Mo., has been appointed general supervisor of air brakes at St. Louis.

J. J. FREIBOLT, road foreman of engines of the Missouri Pacific at No. Little Rock, Ark., has been appointed superintendent of fuel conservation and lubrication at St. Louis, Mo.

A. E. RICE, assistant superintendent of the Pueblo division of the Denver & Rio Grande Western at Pueblo, Colo., has been appointed assistant to the chief mechanical officer, with headquarters at Denver, Colo.

JOHN R. GROVE, assistant superintendent motive power of the Lehigh Valley, with headquarters at Bethlehem, Pa., has been appointed superintendent motive power, with headquarters at Bethlehem.

J. W. WOMBLE has been appointed to fill the newly created position of assistant to vice-president (mechanical) of the Midland Valley, the Kansas, Oklahoma & Gulf and the Oklahoma City-Ada-Atoka, with headquarters at Muskogee, Okla.

MICHAEL A. SMITH, general manager of the Pittsburgh & Lake Erie at Pittsburgh, Pa., retired on October 1. Mr. Smith was

Michael A. Smith

born at Norwalk, Ohio, on September 7, 1872, and was educated in the public schools of Norwalk. He entered the service of the Wheeling & Lake Erie as a locomotive fireman on August 29, 1890, and became locomotive engineer in 1896. Mr. Smith left the Wheeling & Lake Erie in 1899 and in March, 1900, entered the service of the Pittsburgh & Lake Erie as a locomotive inspector, and served in that capacity until June, 1901. From the latter date until November, 1902, he was traveling fireman, and later enginehouse foreman. In June, 1904, Mr. Smith became general foreman at the Glassport shops, and in December, 1912, was transferred to the East Youngstown shops. In September, 1917, he became trainmaster and in June, 1923, assistant superintendent of motive power. Mr. Smith was appointed superintendent of motive power in September, 1927, and general manager in November, 1930.

D. S. NEUHART, master mechanic of the Union Pacific at Los Angeles, Calif., has been appointed superintendent of motive power and machinery, with headquarters at Omaha, Neb.

F. E. MOLLOY, master mechanic of the San Joaquin division of the Southern Pacific at Bakersfield, Calif., has been appointed assistant superintendent of motive power, with headquarters at Los Angeles, Calif.

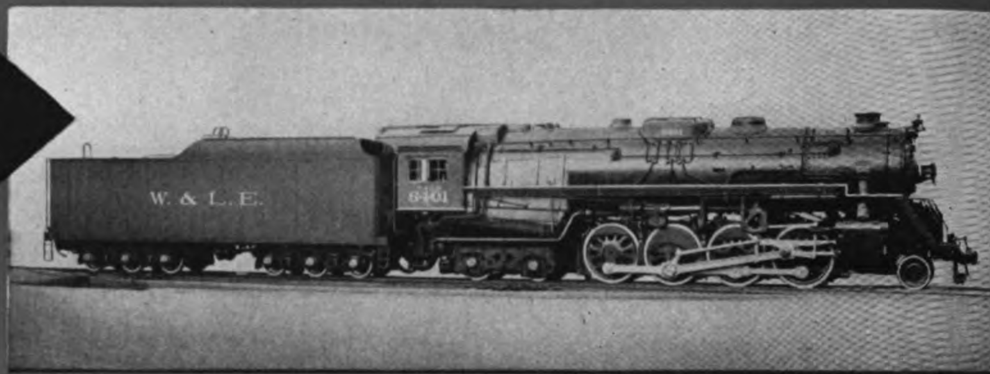
JOHN ROBERTS, chief of motive power and car equipment of the Canadian National, and managing director of National Railways Munitions, Limited, with headquarters at Montreal, Que., is now devoting his entire time to the direction of the big munitions plant operated by the National system.

JOHN P. LAUX, superintendent motive power of the Lehigh Valley at Sayre, Pa., has been appointed assistant to vice-president and general manager, with headquarters at Bethlehem, Pa. Mr. Laux was born at Pittston, Pa., on July 17, 1882, and attended Pennsylvania State College. He entered railroad service on September 10, 1898, with the Lehigh Valley and served until July 11, 1900, as crew caller and crew dispatcher at Sayre, Pa. He then served successively as machinist apprentice and air brake inspector at Sayre before going with the Southern as foreman at Knoxville, Tenn. In October, 1909, Mr. Laux returned to the Lehigh Valley as foreman at Sayre, then serving successively as general foreman at Manchester, N. Y.; assistant master mechanic at South Easton, Pa., and master mechanic at Hazleton, Pa., Sayre, and South Easton, successively. On June 1, 1923, Mr. Laux became shop superintendent at Sayre and on February 15, 1929, he was appointed superintendent motive power at Bethlehem, being transferred to Sayre on July 1, 1938.

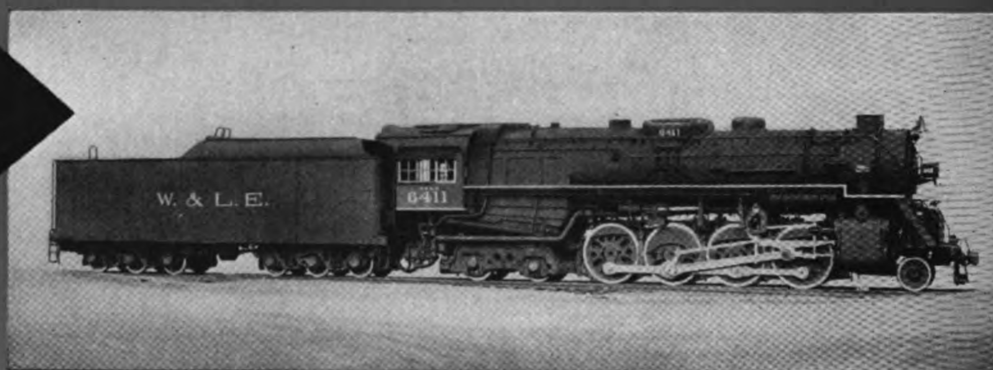
(Turn to second left-hand page)

TEN MORE

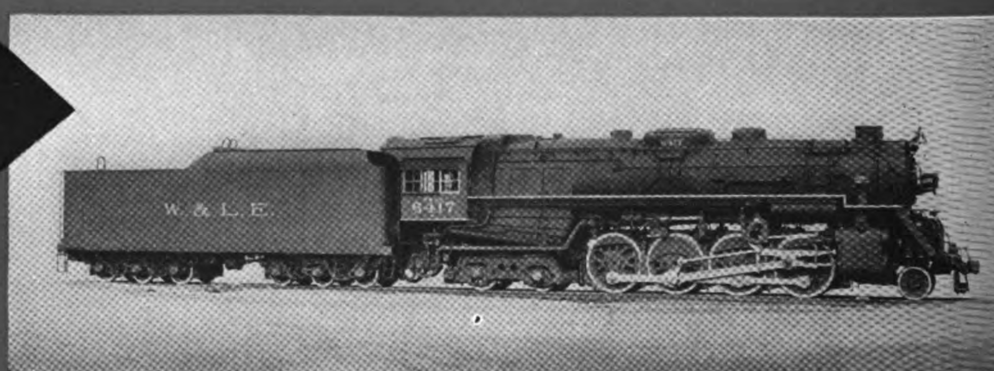
10 BUILT IN 1937



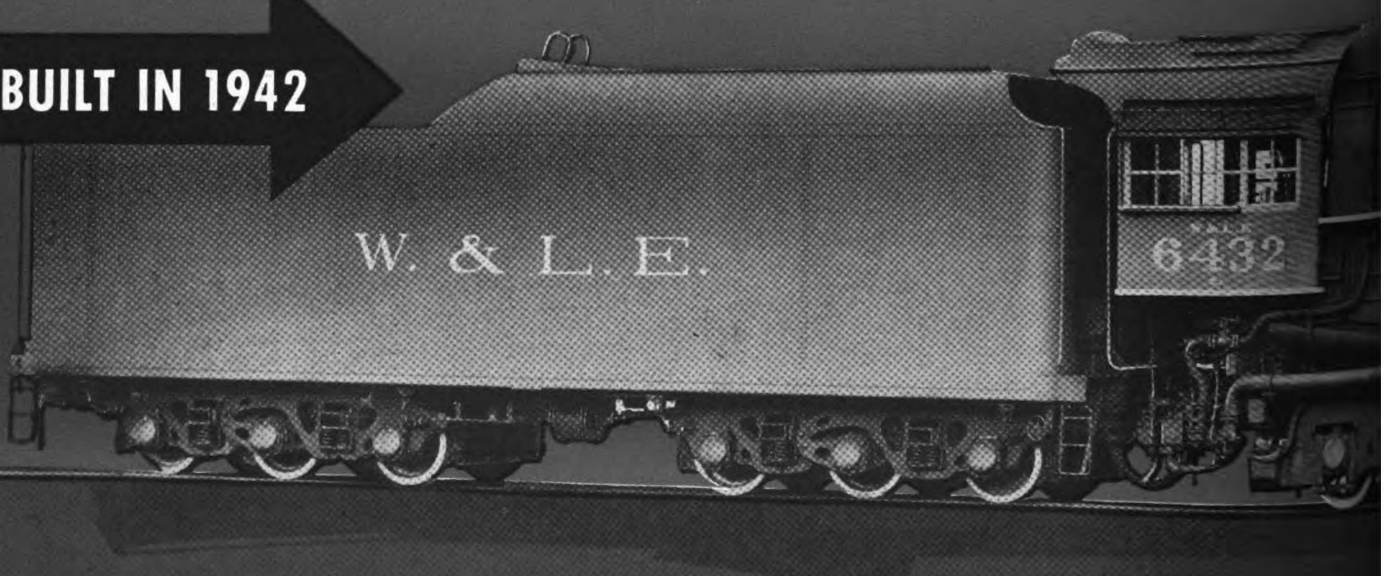
5 BUILT IN 1938



7 BUILT IN 1941



10 BUILT IN 1942



W. C. Sealy, superintendent of the motive-power and car shops of the Canadian National at Montreal, Que., has been appointed general superintendent of motive power and car equipment, with headquar-

W. C. Sealy

ters at Toronto, Ont. Mr. Sealy entered railway service with the Canadian National as a messenger in the shops at Stratford, Ont., in May, 1903. A year later he became apprentice mechanic, terminating his apprenticeship in June, 1908. In November, 1909, he was appointed erecting shop foreman, and in 1910, general foreman at Toronto. Subsequently he was appointed assistant master mechanic, and in November, 1915, became master mechanic. During 1917 Mr. Sealy's services were loaned to the General Car and Machinery Company, and he was employed at Montmagny, Que., as an instructor in the installation of a shell-manufacturing plant. He returned to Stratford in September, 1917, as foreman during a period when that shop was also engaged in the manufacture of shells for the British Army. In 1921, he became general foreman at Stratford, and in October, 1928, was appointed acting superintendent of the motive-power shop, becoming superintendent of the motive-power shop in January, 1929. In February, 1939, Mr. Sealy was appointed superintendent of motive-power and car shops at Montreal.

Edwin Roy Battley, general superintendent of motive power and car equipment of the Canadian National at Toronto, Ont., has been appointed chief of motive power and car equipment, with headquarters at Montreal, Que. Mr. Battley was born on October 21, 1886, at Stratford, Ont. He entered railway service in December, 1902, at Stratford, as a stenographer in charge of the office work for the locomotive foreman in the enginehouse of the Grand Trunk (now Canadian National), later becoming a "caller" for locomotive crews. After a short time, he was transferred to the enginehouse to learn the details of grooming engines, after which he went to work in the motive-power shops and progressed through all phases of apprenticeship to qualify as a machinist in 1908. His first supervisory position was that of inspector at Stratford and his next that of locomotive foreman at Fort Erie. In 1914, he became general foreman of the shops at Deering, Me.; in 1917, master mechanic at Montreal, and in 1918, superintendent at Montreal. In 1927, when the union-management co-operative committees were being developed on the Canadian National, Mr. Battley was the machinist member of the committee of experts organized by the company's Bureau of Economics to study the technical features of the plan which has proved successful in actual operation. From Montreal Mr. Battley was transferred to the Toronto shops, and in July, 1930, was given a leave of absence to work with the National Railways of Mexico in conducting a study of machine shops and preparing recommendations for these establishments. Returning to Canada from Mexico, Mr. Battley was appointed superintendent of shop methods, with headquarters in Montreal, and in April, 1933, was promoted to the position of general superintendent of motive power

Edwin Roy Battley

and car equipment at Toronto. In addition to his other duties, Mr. Battley will be in charge of the System shops in Canada and the United States.

Frank L. Kartheiser, chief clerk, mechanical department, of the Chicago, Burlington & Quincy, has been appointed assistant to vice-president (operation), with headquarters at Chicago, as announced in the October issue of the *Railway Mechanical Engineer.* Mr. Kartheiser was born at Aurora, Ill., on April 19, 1893, and studied engineering. He entered railway service in 1910 as a timekeeper on the Burlington at Aurora, later serving successively as a dispatcher's clerk and clerk and secretary in the office of the superintendent of motive power at Chicago. During World War I he attended the Officers' Training School of the U. S. Naval Reserve and later served as an ensign. In 1919, he served with the U. S. Railroad Administration at Chicago and in 1920 returned to the Burlington, being assigned to mechanical statistical analysis. In 1923 Mr. Kartheiser was promoted to the position of chief clerk to the superintendent of motive power and from 1928 to 1936 was A. A. R. mechanical inspector. He became chief clerk to the mechanical assistant to the executive vice-president in 1936. Mr. Kartheiser has been secretary-treasurer of the Car Department Officers' Association

Frank L. Kartheiser

since 1937 and was president of the Car Foremen's Association of Chicago 1933-34.

Master Mechanics and Road Foremen

K. G. Carnes has been appointed road foreman of engines of the Southern, with headquarters at Spencer, N. C.

J. C. Fields, fireman of the Pocahontas division of the Norfolk & Western, has become assistant road foreman of engines.

T. C. Cory has been appointed master mechanic of the Western division of the Texas & Pacific, with headquarters at Ft. Worth, Tex.

G. C. Bogart, assistant master mechanic of the Southern Pacific at West Oakland, Calif., has been appointed master mechanic of the San Joaquin division, with headquarters at Bakersfield, Calif.

Gomer D. Jones, erecting foreman of the Topeka, Kan., shops of the Atchison, Topeka & Santa Fe, who has been appointed to fill the newly created position of master mechanic of the Southern Kansas division, with headquarters at Chanute, Kan., as announced in the October issue, was born on May 28, 1902, at Williamsburg, Iowa. He received the degree of B.S. in mechanical engineering from Iowa State College in 1924. In June, 1923, he entered the service of the Santa Fe as a special apprentice in the locomotive department. In April, 1927, he became a machinist at the Topeka shops; on May 21, 1927, test department assistant; in October, 1935, assistant to engineer of tests; in August, 1939, system mechanical inspector, and in January, 1942, erecting foreman, Topeka shops.

Car Department

J. M. Nickisher, general car inspector of the Lehigh Valley, with headquarters at Sayre, Pa., has been appointed superintendent car department at Bethlehem, Pa.

G. A. WATERS, division car foreman of the Erie at Meadville, Pa., has retired.

S. C. LUND has been appointed division car foreman of the Erie with headquarters at Meadville, Pa.

H. F. LYONS, general car inspector of the Reading at Philadelphia, Pa., has been appointed acting superintendent car department.

Shop and Enginehouse

SHERMAN OSCAR RENTSCHLER, general foreman in the locomotive department of the Missouri Pacific at Sedalia, Mo., who has been appointed superintendent of shops, with headquarters at Sedalia, as announced in the October issue, was born on October 12, 1904, at Verdon, Neb. He attended

S. O. Rentschler

high school from 1914 to 1918 and entered the employ of the Missouri Pacific on September 19, 1923, and served as a machinist apprentice and machinist at Fall City, Neb., until April 28, 1929, when he became division foreman and enginehouse foreman at St. Joseph, Mo. He subsequently served as division foreman and enginehouse foreman at Omaha, Neb., and Lincoln; Wichita, Kans., Osawatomie and Hoisington; Kansas City, Mo., and St. Louis, and was appointed general foreman at Sedalia on April 1, 1939.

H. H. HICKS has been appointed locomotive foreman of the Canadian National, with headquarters at Mimico, Ont.

L. R. GABLE, assistant enginehouse foreman of the Norfolk & Western at Portsmouth, Ohio, has retired.

AMIL J. BENNIE, shop inspector of the Norfolk & Western, has become assistant foreman of the erecting shop at Portsmouth, Ohio.

IRA O. DIDDLE, assistant foreman in the erecting shop of the Norfolk & Western, Portsmouth, Ohio, has been appointed assistant enginehouse foreman.

ALEXANDER H. MITCHELL, superintendent of shops of the Lehigh Valley at Sayre, Pa., has been appointed superintendent system shops and enginehouse, with headquarters at Sayre.

W. C. BOWRA, locomotive foreman of the Canadian National at Mimico, Ont., has been appointed locomotive foreman, with headquarters at Turco, Que.

E. K. ROGERS, a machinist in the employ of the Chesapeake & Ohio, has been promoted to the position of assistant enginehouse foreman at Hinton, W. Va.

Purchasing and Stores

WILLIAM C. ATHERTON, purchasing agent of the Pere Marquette, with headquarters at Cleveland, Ohio, retired on October 1 after fifty years of continuous railroad service. Mr. Atherton was born on July 3, 1872, and entered railway service in 1892 as clerk in the stores and mechanical departments of the Baltimore & Ohio. He was promoted to the position of division storekeeper, at Willard, Ohio, in 1894 and served subsequently as a clerk in the motive-power departments of the Elgin, Joliet & Eastern; the Chicago & Western Michigan (now part of the Pere Marquette); the Chicago, Peoria & St. Louis (later sold to various roads and partially abandoned); and the St. Louis, Peoria & Northern (now divided between the Illinois Central and the Alton). He was appointed general storekeeper of the Chicago & Eastern Illinois, at Danville, Ill., in 1900, and in 1903 went with the Pere Marquette as general storekeeper. Mr. Atherton became general storekeeper and fuel agent in 1905, and purchasing agent in 1908.

Obituary

TIMOTHY B. ROBERTS, supervisor of apprentices of the Lehigh Valley, who died after a short illness on October 14, 1942, was 56 years old. He was born in Wellsboro, Pa. Mr. Roberts entered the service of the Lehigh Valley as a call boy at the age of 14. He became a machinist apprentice at Sayre in 1905, and after his apprenticeship was employed in the Sayre shops as a machinist for 11 years. In June, 1918, he was made a foreman and in August, 1924, a piecework inspector, continuing in that capacity until February, 1930, when he became supervisor of apprentices. Except for an interval of three years he remained in that capacity until his death.

G. L. LAMBETH, superintendent of motive power of the Gulf, Mobile & Ohio, with headquarters at Jackson, Tenn., died on October 5 after a short illness. Mr. Lambeth was born in Lynchburg, Va., in 1875 and entered railway service in 1894 as a machinist apprentice in the employ of the Southern. In 1910 he went with the Mobile & Ohio (now part of the Gulf, Mobile & Ohio) as master mechanic and on March 20, 1920, he was appointed to the position of superintendent of motive power and car equipment, with headquarters at Mobile, Ala. Three months later, he was transferred to St. Louis, Mo., and later to Jackson. When the Gulf, Mobile & Northern and the Mobile & Ohio were consolidated into one system—the Gulf, Mobile & Ohio—Mr. Lambeth continued at Jackson as superintendent of motive power.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

FACE-MILLING OF STEEL.—Firth-Sterling Steel Company, McKeesport, Pa. Engineering Bulletin No. FE-106, "Hyper-Milling," describes and illustrates a new method for the face-milling of steel with Firthite-tipped cutters.

◆

MACHINE TOOLS.—The Cincinnati Planer Company, Cincinnati, Ohio. Thirty-two-page Bulletin No. 52. Specifications and illustrations of Cincinnati Hypro double housing planers, open-side planers, planer type millers, and vertical boring mills.

◆

PRESS BRAKES.—The Cincinnati Shaper Co., Cincinnati, Ohio. Sixty-four page, spiral-bound booklet, Catalog B-1. Illustrates press-brake applications, bending and punching load charts, features for special work, and dies and their uses.

◆

DEODORANT.—Oakite Products, Inc., Room 1002, Wrigley building, Chicago. Sixteen-page illustrated booklet on Oakite Deodorant No. 1, a sanitation material for cleaning, deodorizing, and disinfecting, in one operation, passenger cars, repair shop washrooms, locker rooms, etc.

◆

BEARING LUBRICATION.—SKF Industries, Inc., Front street and Erie avenue, Philadelphia, Pa. Thirty-two-page booklet, "A Guide to Better Bearing Lubrication." Designs, formulae, and graphs aid in explaining highly technical text on the practical problems of correct ball- and roller-bearing lubrication.

◆

UNIT HEATER.—Wilson Engineering Corporation, Chicago. Bulletin B-2 describes and illustrates the Wilson unit heater, now constructed with a non-critical all-cast-iron core in place of war-critical aluminum and copper, for use in railway shops, engine terminals, storehouses, etc. Specification drawings show dimensions and capacities of the available sizes. Last page illustrates the Wilson cast-grid radiation elements for cooling and de-humidifying compressed air on locomotives.

◆

STRESS-STRAIN RECORDING. — Baldwin Southwark Division of the Baldwin Locomotive Works, Philadelphia, Pa. Twenty-two-page illustrated booklet, No. 162, "Automatic Stress-Strain Recording," in four parts: Part 1, application of the recorder to Army and Navy specification testing; Part 2, interpretation of the stress-strain curve; Part 3, description of the recorder and accessory extensometers; Part 4, condensed comment on operation and maintenance.

December 1942

Railway Mechanical Engineer

FOUNDED IN 1832

Published monthly by Simmons-Boardman Publishing Corporation, 1309 Noble Street, Philadelphia, Pa. Entered as second-class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, \$3.00 for one year, U. S. and Canada. Single copies 35 cents. Vol. 116, No. 12.

RAILWAY MECHANICAL ENGINEER

Founded in 1832 as the American Rail-Road Journal

With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office.

DECEMBER, 1942

Volume 116 *No. 12*

Roy V. Wright
Editor, New York

E. L. Woodward
Western Editor, Chicago

J. L. Stover
Associate Editor, New York

C. B. Peck
Managing Editor, New York

H. C. Wilcox
Associate Editor, New York

Robert E. Thayer
Vice-Pres. and Business Manager, New York

General:

Locomotive:

Car:

Editorials:

The Reader's Page:

Backshop and Enginehouse:

Car Foremen and Inspectors:

Published on the second day of each month by

Simmons-Boardman Publishing Corporation

1309 Noble street, Philadelphia, Pa. Editorial and Executive Offices: 30 Church street, New York, and 105 West Adams street, Chicago. Branch offices: Terminal Tower, Cleveland; 1081 National Press bldg., Washington, D. C.; 1038 Henry bldg., Seattle, Wash.; 300 Montgomery street, Room 805-806, San Francisco, Calif.; 530 W. Sixth street, Los Angeles, Calif.

Subscriptions (including, when published, the daily editions of the Railway Age, published in connection with the convention of the Association of American Railroads, Mechanical Division), payable in advance and postage free, United States, U. S. possessions and Canada: 1 year, $3; 2 years, $5. Foreign countries, not including daily editions of the Railway Age: 1 year, $4; 2 years, $7. Single copies, 35 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.), and is indexed by the Industrial Arts Index and also by the Engineering Index Service. Printed in U. S. A.

RAILWAY
MECHANICAL ENGINEER

Railroads' Use of

Flame Hardening Processes*

Part I

By F. C. Haase†

Improvements in methods since the last war has increased usefulness of flame-hardening —Standard equipment available for most applications— Procedures must be adapted to the demands of the job

During the first World War, one important factor recognized by our industrial leaders was the need for improved methods and the new equipment and materials to meet the demands of mass production. As a result of this need, each succeeding year since then has seen more developments and inventions in all branches of industry than had occurred in any other period in the past.

The high standards that are attained today in mass production of materials, with respect to the physical, chemical, and dimensional tolerances that were undreamed of years ago, would hardly have been possible without the development of alloy steels and methods for heat-treatment. The usual heat-treating processes involved casehardening, with water, oil or air quenchin, and each process imparted to the steel definite improved physical values accompanied, however, by the natural distortion of the piece and often with residual quenching stresses left within it. For many parts this condition was unsatisfactory, with the result that the hardness would have to be drawn back to 250 to 300 Brinell, so that the part or area could be machined after treating without making it necessary to resort to the more expensive method of finishing by grinding.

Eventually the problem had to be faced and in 1925 work was undertaken to develop an oxy-acetylene process that would make possible the heat-treatment of parts that could not be handled satisfactorily by the usual processes, because of the size of the parts, distortion, or unsatisfactory wear or impact resistance obtainable with a hardness of only 250 to 300 Brinell.

Early History of Flame-Hardening

A process of flame-hardening was at that time in use in England by the Metropolitan Vickers Company and the Patent Gear Hardening Company. The process was distinctly radical and definitely successful. Development of this process was hindered at the outset by the general lack of suitable water-cooled apparatus capable of maintaining broad areas of stable oxy-acetylene flames in close contact with heated metal. Because of this lack only limited use was made of the heat of a single oxy-acetylene flame for treating restricted surface areas.

In this country the introduction of rail-end hardening to reduce rail-joint maintenance in 1927, and the subsequent widespread adoption of this process as a routine maintenance operation by many railroads, marked the first large-scale application of flame-hardening and focused attention on the need for development of apparatus suitable for other purposes.

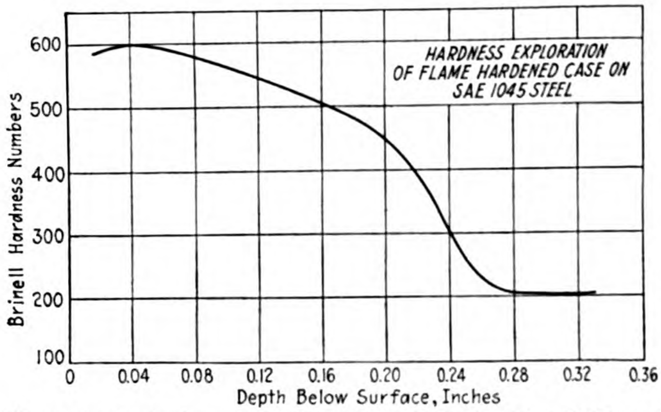
During the past decade, flame-hardening of gear teeth of all types has gradually become a standard operation, and an active development of the process to include the hardening of common wearing surfaces such as cams, guides, coupling boxes, pulley sheaves, roll wobblers, ball and roller races, crankshaft journals, and cylinder liners has made substantial progress.

In the railroad field active development has been going on since 1939. Work was started in this field only after it was determined that apparatus and technique had been developed to a point of satisfactory flexibility and standardization.

The Effect of Flame-Hardening on Steel

Flame-hardening must be differentiated from casehardening, carburizing, nitriding, or any other practice that involves a chemical change in the surface of the material. The flame-hardening process does not alter the chemical composition. When the process was first introduced, the impression arose that the excess acetylene flame added carbon to the steel, but this is not always true. A strictly neutral oxy-acetylene flame is used as a heating medium and the hardness is produced by quenching while the surface of the steel is still above the critical temperature. The intensity of the oxy-acetylene flame induces heat so rapidly that it penetrates the material only a fraction of an inch. This imparts to the surface of the metal a hardened case which may vary in depth from a mere "skin" to ¼ in., depending on the composition of the base metal, on the operating methods used, the length of heating time, the quenching media used, and similar factors.

* Paper read before meeting of Southern and Southwestern Railway Club, Atlanta, Ga., September 17, 1942.
† General manager, The Oxweld Railroad Service Company, Chicago.



Illustrating the hardness obtainable in flame-hardening S.A.E. 1045 steel

When steel is heated above its upper critical point, the carbon is brought into a state of solid solution with the iron, or, in other words, carbon is diffused uniformly throughout the mass. If the heated mass is then allowed to cool gradually to room temperature, the carbon is precipitated to the grain boundaries, producing a coarse-grained structure which is relatively soft.

When the cooling is rapid or sudden, as in the flame-hardening process, the constituents have not time to come out of solution and the structure that results from the heating is stabilized and arrested. Thus a hard or martensitic structure is formed at the surface. There is no sudden change in chemical analysis and also no sharp line of demarcation between the hardened zone and the softer core such as is found in casehardened work. This fact is due to the balancing or tempering action of the metal beneath the hardened surface, which produces a gradual transition from the hard martensitic structure at the surface to troostite, then sorbite, and finally to the original unaffected structure of the core. The increased toughness resulting from this physical condition, combined with the higher Brinell hardness, accounts for the successful wear resistance of parts that have been given this treatment. The hardness zone produced is at least two or three times the depth of that obtained by carburizing, and will not spall, check, or crack with impact, vibration, or deformation.

Since there is no hardening deeper than from 1/16 in. to 3/8 in. below the surface being treated, the balance of the metal will be in a soft annealed condition with a minimum of accompanying stresses. This accounts for the fact that there are practically no failures in the service of flame-hardened parts, whereas fully 80 per cent of the failures of work hardened by other methods are breakages caused by residual quenching stresses. It is generally desirable to give flame-hardened parts a low drawing treatment of 400 deg.

Types of Heating Heads

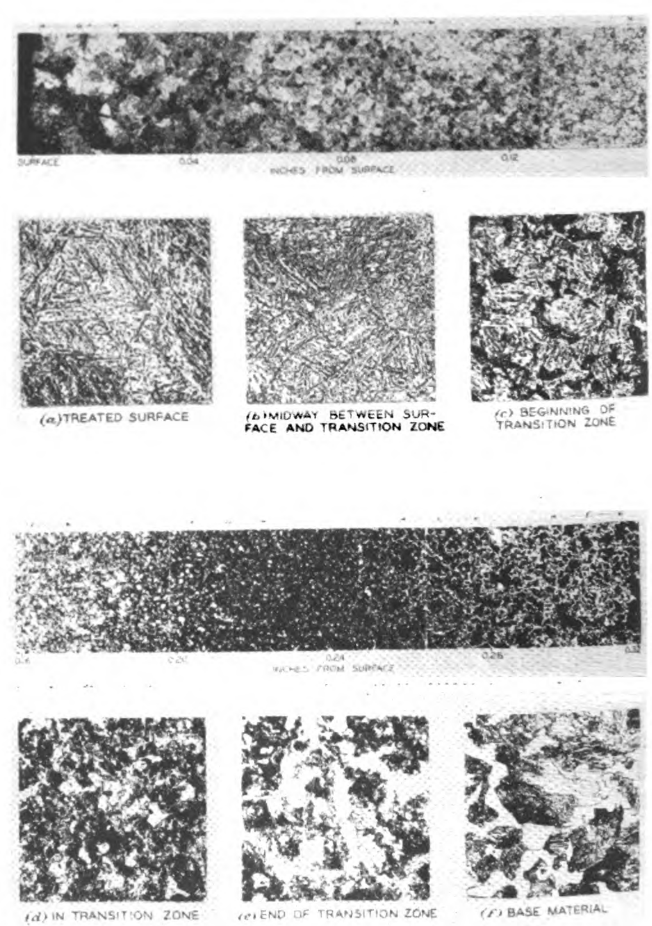
There are certain standard heating heads as well as special hardening heads which can be made. Most of the work encountered in railroad shops uses one of three types of standard hardening heads. Two of these heads are suitable for most of the applications encountered. The larger of the two will cover an area 4 in. wide and is rhomboid in shape so that a number of the heads can be grouped to cover areas wider than 4 in. The smaller of the two heads is made to cover an area 1½ in. wide. Each of these types of head is water cooled.

The larger head has outlets for 30 small screw-in type tips; the smaller head has outlets for seven of the same type. These tips vary in length from 9/16 in. to 1 7/16 in.; and in orifice dimensions from No. 65 drill size to No. 50 drill size. The tips can be grouped in the head to conform to the many different shapes and sizes of the various objects to be treated. By placing the short tips at the center of the head and the long tips at the edges, the flame contour can be made to fit a curved surface to be hardened on an engine or trailer rocker casting. As an alternative, if the long tips are placed at the center and the short tips at the edges of the head, the flame contour can be made to fit a concave surface such as that at the bottom seat on both the engine and trailer truck rockers. Orifice sizes in the tips vary so that the heat intensity of the flames can be adjusted for different classes of work, such as adjacent thick and thin sections. Small copper plugs are also furnished for the 30-flame and 7-flame heads, so that sections of the head can be blanked out in order to accommodate the flame width to the area to be covered.

Water for the cooling of the heads is brought to the heads through a ¼-in. O.D. copper tube. The water circulates through the hollow heads and is exhausted through a suitable outlet connection at the top.

Quenching Heads

The water-quench heads used in conjunction with the flame-hardening heads are merely brass blocks with two rows of No. 60 drill size orifices on ⅛-in. centers drilled



Photomicrographs of a cross-section of flame hardened S.A.E. 1035 steel showing the improved structure obtained

in them. The orifices are made in a staggered pattern to provide an almost solid sheet of quench water. The quenching heads are connected directly to the water outlet of the hardening head and are placed immediately

adjacent to the hardening head. The water jets strike the metal surface approximately ¾ in. or ½ in. away from the last row of heating flames. The water outlets are drilled at an angle, so that the jet of water striking the metal surface will not bounce back into the flame and cause interference.

Heads for Flame-Hardening Gears

There are three sizes of standard gear-hardening heads. These are made in pairs, so that both sides of a gear tooth can be treated simultaneously. In these heads the flame and quench-water orifices are drilled to the required size and spacing, and no screw-in tips are used. These heads also are watercooled.

The three heads, the 30-flame, 7-flame, and gear-hardening head, have been found entirely satisfactory for railroad work where the flame-hardening applications have been of large variety and of relatively small quantity. In industrial applications on repetitive work it is economical to use special heads for each application. This is possible because of the infrequent setup changes. In railroad work where, for instance, it may be necessary to change from hardening locomotive guides to stoker screws several times during the course of the working day, heads of suitable flexibility are necessary.

There have been certain applications, however, that require special heads. This is necessary mainly because of the space-clearance requirements in the areas to be hardened. Special heads have been made, for instance, to fit piston-head ring grooves, so that all the grooves can be hardened with one revolution of the piston head; for multiple wear guides, so that all sides of the various wearing surfaces can be hardened; and for valve-link grooves, in order to harden both sides of the guiding groove in a locomotive link. Other special heads can be manufactured for special operations, if the application warrants.

Flame-Hardening Methods

There are four different ways of flame-hardening. These are, stationary, progressive, spinning, and combination.

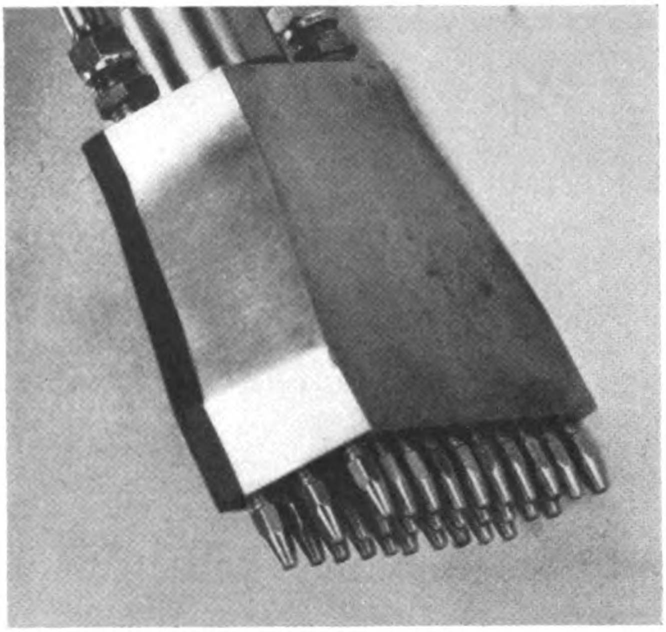
Where limited areas of the part are to be treated, the area can be heated above the critical temperature by application of heat from a standard welding blowpipe, the entire area being brought to the correct heat by manipulating the blowpipe back and forth across the surface. The blowpipe is then removed and the surface is quenched with water, or compressed air, or immersed in oil as may be required by the particular composition of the material. Extensive use is made of this stationary method in the hardening of rail ends. An area the width of the running surface of the rail and a few inches long at either side of the joint is heated in less than a minute with suitable tips to a hardening temperature. No quenching medium of any kind is used other than the atmosphere and the natural quenching action of the relatively cooler adjacent rail metal. With such treatment a Brinell hardness of from 365 to 375 is obtained, and after a few weeks of cold-rolling under traffic, the hardness will increase to about 400 Brinell. The hardness thus produced resists the battering action of wheels at the rail joint which otherwise would rapidly wear the rail section at this point.

Progressive Method

The progressive method of flame-hardening is the one most generally used in railroad shops. It is done either manually or mechanically. The mechanical method is much to be preferred because in this procedure the distance between the flame end and the work, as well as the speed of travel, must be held constant and it is practically impossible to produce uniform results manually.

The progressive method is used for operations where the blowpipe and work move with respect to each other. This may be accomplished by moving the hardening heads over the material to be hardened, as for instance when a crosshead guide is hardened, or by moving the work past a stationary hardening head, as is done when the ring grooves of a piston head are hardened.

To move the hardening heads, any type of positive reliable motive power can be used. In many railroad installations the equipment is mounted on a small portable cutting-machine carriage. A new type of carriage has been introduced recently which can be economically made in the shop and which is more satisfactory and accurate than the portable cutting-machine carriage. Special adaptations of old planers, lathes, and other similar equipment are satisfactory for progressive flame-hardening setups.



The 30-flame oxy-acetylene flame-hardening head can be adapted for use on many types of flat and curved surfaces

When flame-hardening a plane surface, the lighted oxy-acetylene blowpipe, with a flame-hardening head having sufficient flame area to cover the path to be hardened, is directed across the surface to be hardened at the maximum speed which will heat the steel to a hardening temperature. The blowpipe head is placed so that the tips of the inner cones of the oxy-acetylene flames are $\frac{1}{16}$ in. to ⅛ in. from the surface being hardened. A stream or spray of water, which progressively quenches the heated surface, is directed immediately behind the flame.

The speed of flame travel is determined by operating variables, such as flame intensity, the type of the steel being treated, the temperature desired, and the depth of case desired. The speed may vary from 4 in. to 10 in. per minute, although the usual speed is between 6 in. and 8 in. per minute.

Flame-Hardening Cylindrical Surfaces

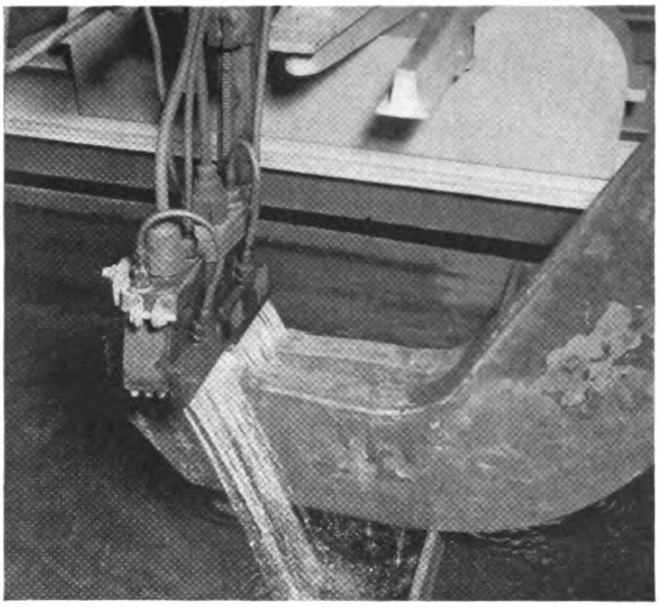
On cylindrical parts, one or more of four general procedures are followed, the band progressive, the spiral-band progressive, the band spinning, and the progressive

spinning methods. All four are applicable to hardening either external or internal cylindrical surfaces, continuously or in localized bands. The method chosen for a particular job depends on the nature of the work and the facilities available. The most uniform hardness is produced by the spinning methods, which are usually the most satisfactory.

Essentially the two progressive methods are direct adaptations to circular work of the technique applied in progressive hardening of flat surfaces; the work is rotated slowly past the heating flame and quench jets. In the spinning technique, on the other hand, the work is revolved at fairly high speed before the flames so that the entire circumferential area is heated before quenching takes place. The advantage of spinning is that it does not leave soft zones.

Band Progressive Method

Large-diameter cylinders, rolls, shafts, pins, and other cylindrical parts, over 4 in. in diameter, can be flame-hardened by the band progressive method. The work is



The water-quench head follows the heating head and floods the hot surface with quenching water—The hardening of the bearing surfaces on two truck equalizers is shown

usually mounted on a lathe or another machine which can be geared to rotate the work at speeds of from 3 to 10 surface in. per min. The flame-hardening apparatus is then mounted on the lathe-carriage tool post or a similar mount capable of lateral movement parallel to the axis of rotation of the work. The multiflame heating head used for this work should be water cooled and may have a built-in set of water jets for the quench, or it can be followed closely by a separate quenching head or stream. Hardening is accomplished by rotating the work past the flames at a peripheral surface speed which may range from 3 in. per min. to 6 in. per min. These figures are subject to some variation, depending on the thickness and the chemical analysis of the material to be hardened.

Upon the completion of one revolution of the circular object, the flames are extinguished and the flame-hardening head is shifted to a new position for hardening the next adjacent band. A narrow space of $\frac{1}{8}$ in. to $\frac{1}{4}$ in. should be left between head positions to allow for heat conduction outside the flame-swept zone. As additional precautions against overlapping or reheating of the hardened bands, extra quench jets should be provided at both ends of the heating head, and in some work, an auxiliary cooling flow of water may be directed at the adjacent zones to prevent softening. These water streams should be held as close to the flames as possible.

The band progressive method is generally used where it is not essential that the hardness be consistently uniform over the entire length and on parts with such extremely large diameters that it would be economically or physically impracticable to employ the spinning method.

Spiral-Band Progressive Method

While the band progressive method is suitable for flame-hardening either localized bands, such as bearing surfaces, or for treating the entire length of a large-diameter shaft, the spiral-band progressive method is somewhat better suited for hardening long cylindrical surfaces of 4-in. dia. and larger. In this method, as the work revolves, the flame-hardening head is moved laterally at such speed as to move one head width along a line parallel to the axis of the work with each complete revolution, thus heating a continuous spiral band, and covering the entire surface of the work in one continuous treatment.

The same precautions against overlaps and edge-zone softening should be observed as in the band progressive method. In addition, a separate water quench should be provided at the ends of the work to prevent overheating or burning of the edges as the flames start and finish the spiral. The advantage in this technique is the avoidance of soft end zones, which may occur at the starting-stopping point of each band in the band progressive method.

Band Spinning Method

For hardening comparatively narrow bands of complete circumference, the band spinning method produces far better results than the progressive method, principally because it leaves no soft zones. It is best applied to cylindrical objects up to 3 in. in diameter. There are no overlaps or soft zones, and the uniform, overall heating before quenching permits hardening to any depth.

A broad flame-hardening head of the width of the band to be hardened is employed. The quench may be incorporated in the heating head, or it may be separate from it. With either type of head the heating and the quenching are separate, successive operations. The work is mounted in a spindle or lathe and revolved at a speed of 1,000 surface in. per min. The flames are allowed to impinge upon the work for only a brief period, usually less than one minute, and often as little as 10 seconds on parts of small diameter. With the extinguishing of the flames, the quenching jets are turned on and allowed to play upon the spinning part until it is fully cooled.

Two or more heating heads may be used on parts of larger diameter to assure a shorter heating time and thereby obtain the desired surface hardening effect with only shallow penetration of the heat.

The speed of the process lends itself to automatic coordination and control. If the parts to be hardened are small, they may be released automatically from the spindle and dropped into a quenching bath, rather than using specifically located quenching jets.

Progressive Spinning Method

For flame-hardening long cylinders, shafts, piston rods, and similar objects, the progressive spinning method is better than any of the methods described previously. This method is rapid and leaves no side or end zone overlaps because it is a continuous heating and quenching process that progresses uninterruptedly from end to end of the

(Continued on page 518)

Pressed Steel Builds

New York Central Coaches

Car bodies of riveted girder construction; the underframes of welded construction with cast-steel platforms — Unique application of gunmetal mirrors and a distinctive color scheme feature the interiors

THE New York Central recently placed in service 25 passenger coaches which were built by the Pressed Steel Car Company, Inc. These cars are the last of the 95 coaches, orders for which were placed with three builders during 1941. Those built by the Pullman-Standard Car Manufacturing Company and the American Car and Foundry Company are similar both in body construction and decorations. The coaches built by Pressed Steel differ from the others both in construction and decorations. The floor plans of all of the cars, however, are similar in arrangement.

Construction Details

The car body, including all outside sheets, is primarily built of USS Cor-Ten steel. Because of the inability to obtain all of the materials contemplated, however, substitutes were found necessary in many instances which increased the weight of the car body somewhat over that originally proposed. The principal dimensions and weights of the coach are shown in the accompanying table.

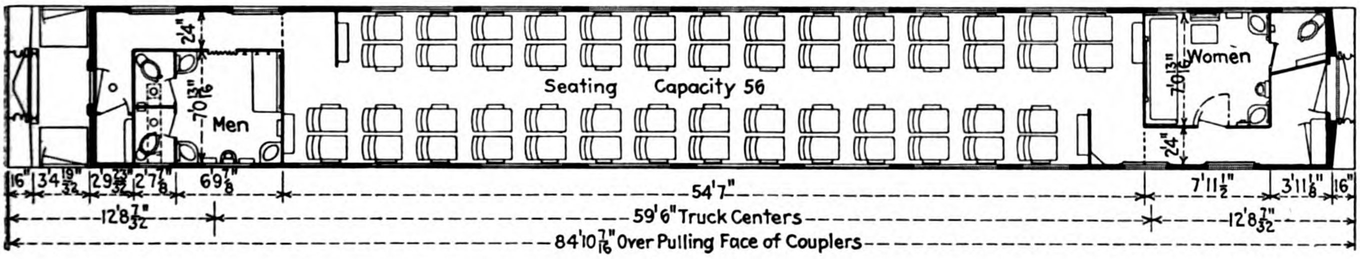
The side frame is of the girder type of riveted construction, while the underframe—i. e., the bolsters, cross-bearers, and center sills—are of welded construction. The ends of the cars are equipped with a General Steel Castings cast-steel platform and center-sill casting, welded to the center sills. The center sills consist of two A. A. R. Z-sections, 31.3 lb. per ft., with the top flanges connected by a continuous weld. The cars are equipped with the Waughmat twin-cushion type draft gear, cast-steel yokes and National A. A. R. tight-lock couplers.

The folding steps and vestibule trap doors were furnished by O. M. Edwards, and Morton Kass chrome-steel treads are applied on the steps. The cars are arranged for end closure and have Morton vestibule diaphragms.

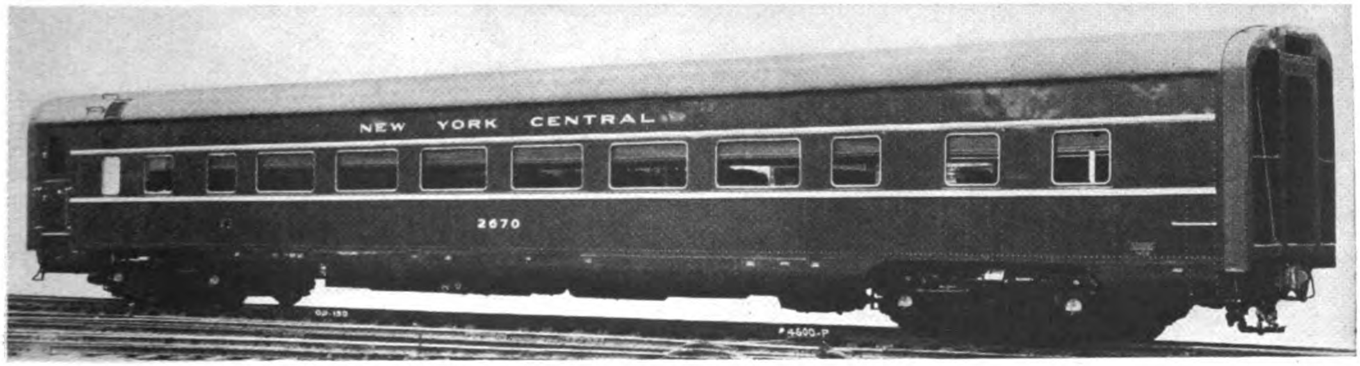
The car is insulated with Fiberglas at the sides, ends, floor, and roof. The floor is of the Keystone type, of galvanized steel, with Tuco lightweight composition flooring applied on top. The cooling unit of the electric water cooler is located above the ceiling in the women's

Principal Dimensions and Weights of the New York Centra Coaches Built by the Pressed Steel Car Company, Inc.

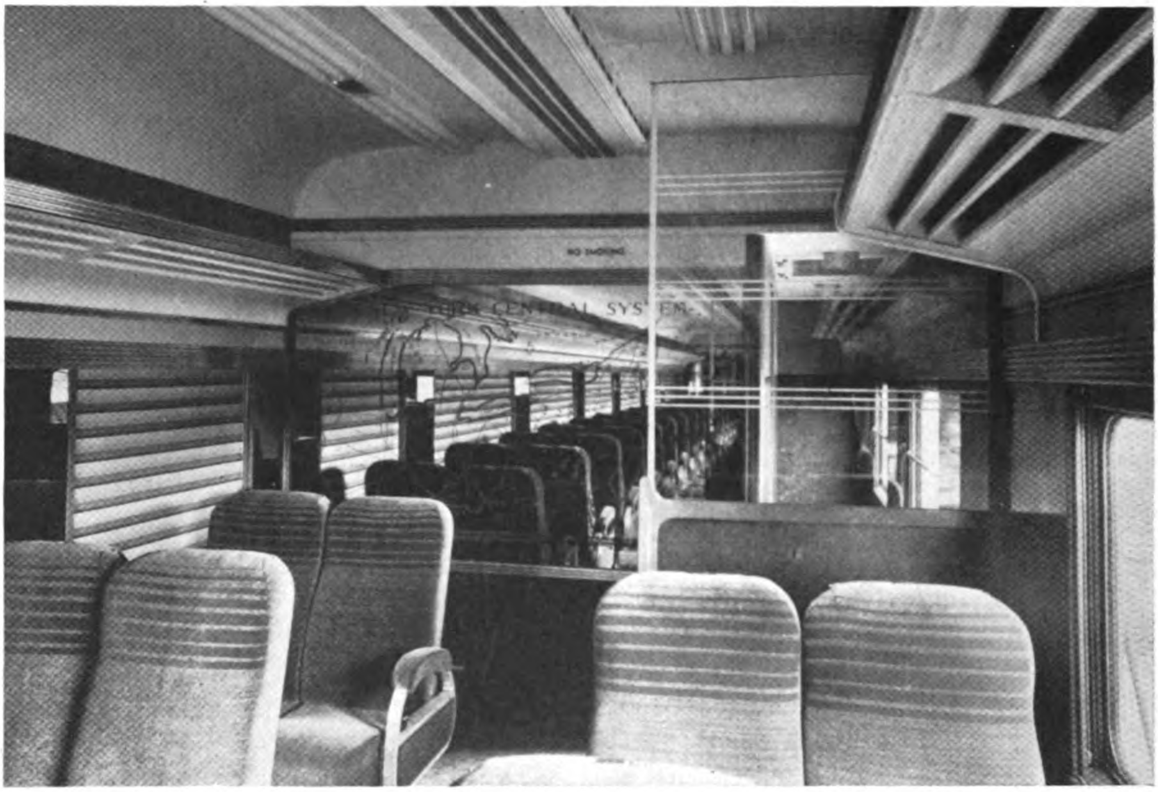
Total length over face plates coupled, ft.-in.	84–10–7/16
Center to center of trucks, ft.-in.	59–6
Height of rail to top of carline, ft.-in.	13–6
Width over side sill, ft.-in.	10–0
Weight of car body, lb.	93,280
Weight of two four-wheel trucks, lb.	39,902
Total weight, lb.	133,200
Seating capacity	56



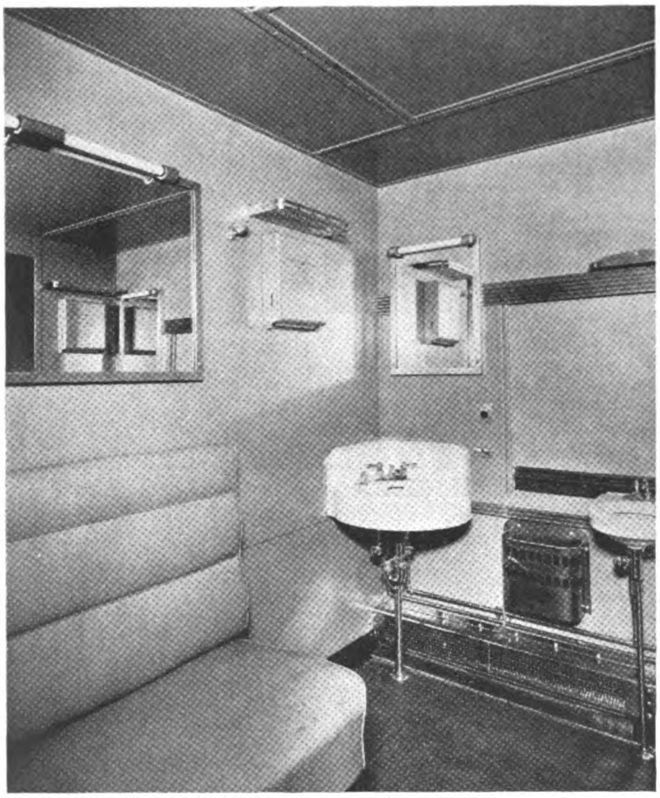
Floor plan of the New York Central coaches



New York Central coach built by the Pressed Steel Car Company



A map of the New York Central System is etched on the gunmetal mirror at the end of the passenger compartment



In the men's lounge

lounge. The fount is located on the passageway side of the separating bulkhead at the women's end of the car.

Lighting Equipment

The lighting genemotor consists of a Safety Car Heating & Lighting Company 20-kw., 80-volt generator and a 15-hp., 220-volt, three-phase induction motor assembled as one unit and mounted on the car body, using resilient mountings designed for a proper weight distribution. The genemotor is driven by a Spicer mechanical drive with automatic clutch. Plug receptacles are located on each side of the car for providing a.c. current to the three-phase motor from standby service for the operation of the air-conditioning unit at terminals and stations.

The genemotor regulating apparatus consists of a Safety Car Heating & Lighting Company generator regulator, automatic switch relay, and lamp regulator. The lamp regulator is set at 60 volts at the center of the lamp load.

General illumination is supplied by one 40-watt magnifying lens type lighting unit over each seat. Translucent plastic oval-shaped louvers in the space between the lenses give the appearance of continuous fluorescent lighting fixtures. The plastic louvers are lighted when the main lights are turned off by a 10-watt blue night bulb located midway between the lens type units. On the vestibule platform, in the passageways, toilets, and lounge rooms are individual lamp fixtures. Thirty-two cell, 600-amp. Gould storage batteries are used.

Air Conditioning

The Frigidaire electro-mechanical air-conditioning apparatus is of seven tons' capacity. It consists of a compressor-condenser unit located below the car floor and the air-conditioning unit above the ceiling of the men's lounge.

The insulated air duct in the center line of the ceiling of the passenger compartment is divided into a pressure and a diffusion duct, with pressure at the top and diffusion below. For convenience in cleaning the lower panels of the ducts are hinged full length.

The floor-heat is provided by fin-tube radiation with

Vapor-type thermostatic control. The train line consists of $2\frac{7}{8}$-in. outside-diameter seamless-steel tubing, with Wovenstone insulation on all steam pipes, Vapor end valves, and couplers with Vapor horizontal type insulated steamheat connections.

Air Brakes

The cars are equipped with the New York Air Brake Schedule HSC brakes with D-22-AR control valves, and two 12-in. by 10-in. cylinders mounted on each truck, with an automatic slack adjuster for each cylinder. The hand brake, at the platform end, is the National Peacock No. 800-L type connected to brake shoes on both sides of the truck at that end of the car.

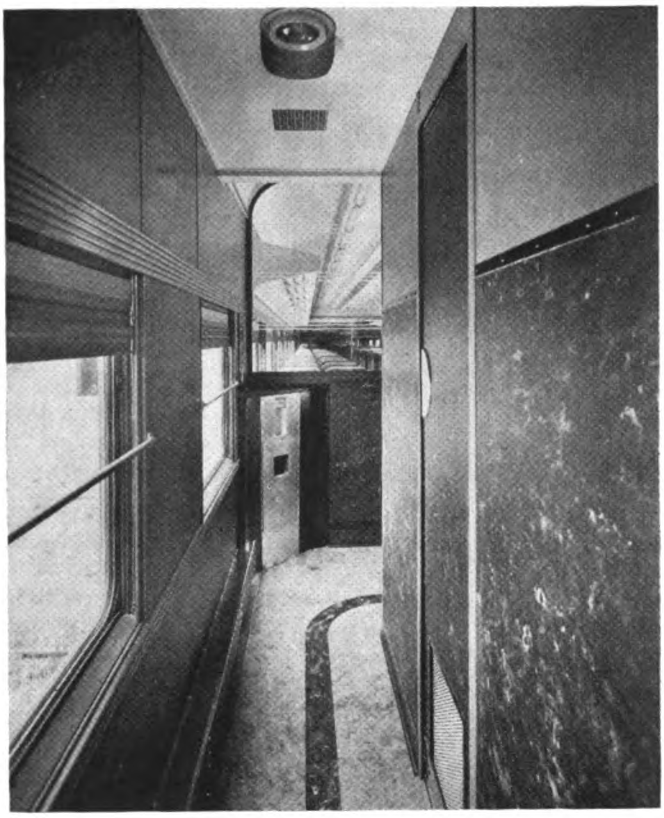
Trucks

The trucks are of the General Steel Castings single-equalizer type with bolster anchors in lieu of chafing plates. They have a 9-ft. wheel base and are fitted with Simplex clasp brakes. The bolster springs as well as the equalizer springs are of the coil type furnished by the Crucible Steel Company. The greater deflection of the coil bolster springs effects smoother riding at high speeds. The action of the bolster springs is controlled by Monroe one-way shock absorbers. The axles, which are of the latest A. A. R. design, are arranged for the application of $5\frac{1}{2}$-in. by 10-in. Timken roller bearings. The trucks have Armco 36-in. diameter wrought-steel wheels with 11-in. hubs. They are fitted with Miner roller side bearings. The truck center pins are the Miner locking type.

Between the body center plate and body bolster is a sound-deadening rubber cushion which covers the entire center-plate base. Between the truck and body center plate is a manganese-steel wear plate, and a Fabreeka sound-insulation filler under the truck center plate.

Interior Equipment and Decoration

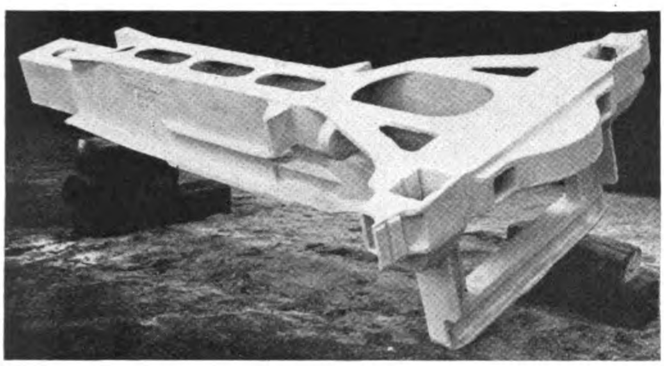
The interior decoration and color schemes for the Pressed Steel coaches were developed by the builder with Lurelle Guild, industrial designer, New York.



Looking into the coach from the corridor opposite the women's lounge

Interior of one of the New York Central Coaches—The upholstery is blue green; the ceilings, bone white with satin-finish metal mouldings—The pilaster mirrors are gunmetal

In the main compartment of each coach are double-rotating, reclining seats furnished by the Transportation Seat Company. The seats have foam rubber cushions and folding footrests. They are upholstered in Chase two-tone striped blue-green mohair. The floor underneath the seats is covered with black Marbelle linoleum and between the seats with gray-white Marbelle. These black and gray coverings terminate at the linoleum inlaid strips in the center of the aisle. The wainscoting from the top of the heater guard to the window sill is painted blue-green to match the seat covering. The space above the window header to the top of the molding underneath the continuous basket rack is painted aluminum; the ceiling above the molding is bone white. The window sills are sloped.



The steel platform and center-sill casting includes the draft-gear pocket, center sills, body-bolster spacer, coupler carrier, and buffer beam

The pier panels between the window openings from the sill to the window header are covered with gunmetal mirrors surrounded by gunmetal-colored moldings, and on each of the bulkheads at the ends of the passenger compartment, from a height in line with the top of the window sill to the top of the basket rack, is a full-size gunmetal mirror. On this appears a map of the New York Central System showing the principal lines and larger cities. The upper portion of the full-height bulkhead between the end seat and passageway at each end of the car is of etched Herculite glass.

Variegated colors, which harmonize with the color scheme of the interior of the main passenger compartment, give the interior face of the Pantasote shades the appearance of Venetian blinds.

The exterior face of the shades is green. They are operated by cable fixtures furnished by Adams & Westlake.

The window sash are stationary and consist of Adams & Westlake double-glazed dehydrated units having ¼-in. polished plate glass on the outside and ¼-in. laminated safety glass on the inside, removable from the inside of the car. The continuous built-in basket racks have a specially designed louvered arrangement which allows vision into the racks when placing baggage in them but which conceal their contents from seated passengers.

The tops of the baggage racks are covered with chrome steel cut out for the insertion of the louvers.

The moldings below the window sills, above the window header, on the basket-rack front, and the center moldings at the bottom of the air duct are of satin-finish chrome steel. The moldings at the basket-rack front and at the window sills are continued on the bulkheads at the ends of the passenger compartment above and below the large gunmetal map mirrors.

Both sides of the passageway, at each end of the car, including the women's lounge-room door, are covered with Linowall to the height of the window header. This material resists marring or damage by hand luggage.

The coaches have a vestibule platform at one end only. The men's lounge at the vestibule end has a floor covering of blue Jaspe linoleum cut diagonally from the corners of the room to the center. The edges of the linoleum terminate in a 4-in. black rubber cove molding. The walls and ceilings of the lounge are periwinkle blue. The two-passenger settee is upholstered in Chase Redo. The lounge is equipped with one dental bowl and three white enamel lavatories. Over each of the lavatories is a 110-volt receptacle for electric razors. There are mirrors with 12-in. Lumiline lamps over each lavatory and over the settee. On the door to each of the two toilet annexes are full-length mirrors, and at the entrance to the lounge is a portiere.

The women's lounge and toilet are at the stub end of the car. The flooring of this lounge is covered with eggplant linoleum, the edges of which also terminate in a 4-in. black rubber cove molding. The walls and ceilings are semi-gloss peach bloom. The equipment in the lounge includes a full-length sofa covered with Chase fabric plush of a color to harmonize with the interior painting; a dresser with a vanity chair; two white enamel lavatories; a dental bowl, and mirrors with lighting fixtures of the same design as in the men's lounge. The door to the toilet annex has a full-length mirror. At the entrance to the women's lounge is a door and a semicircular portiere.

The water-pressure system has a 200-gal. tank and furnishes hot and cold water to the lavatories.

Railroads' Use of Flame-Hardening Processes

(*Continued from page 514*)

workpiece. The applications of this technique are limited only by the size of the work and the investment in equipment which this justifies.

As in band spinning, the workpiece is revolved at a speed of about 1,000 surface in. per min. Flame-hardening heads for this application are usually ring shaped to fit around the workpiece. For the larger diameters, they are composed of segments, each usually served from a separate supply of oxygen and acetylene. The heads are mounted on a suitable carriage to provide lateral motion of from 3 in. to 10 in. per minute and are followed closely by a similarly constructed quench ring containing water jets. The rate of forward travel depends on the hardness depth desired and is further affected, somewhat, by the thickness of the part, since a larger mass of metal will require a slower speed for adequate heating.

Because of the high rate of heat conduction into the base metal, it is often necessary in progressive spinning to provide auxiliary cooling jet rings ahead of and behind the heating heads. The forward quench prevents withdrawal of heat from the heated zone in advance of the flames. The trailing quench serves to prevent heat build-up behind the quench, which might cause a drawing action in the hardened metal. An internal quench ring prevents excessive heat penetration on hollow parts.

The application of flame-hardening to a particular piece of work may be done in a number of ways, as is evident from the various techniques described. Which one to use for a particular job is determined, not only by the degree of hardness desired, but by economic factors as well. Within certain limits, all methods produce satisfactory flame-hardening, but each has advantages for specific jobs.

(*This paper will be concluded in the January issue*)

Methods of Systematic

Treatment of Feedwater*

Karmen-Winger Studios

J. P. Powers,
Chairman

A review of various types of treatment—Blow-down equipment and procedures of road and terminal blowing discussed

WATER treatment has done so much for the railroads in the reduction of boiler work that it is of never ending interest to the boiler makers. It is with considerable pride that we can show that, during all the years when our trade was losing a large amount of work due to the results of water treatment, we always supported the water-treatment work and urged the extension of this program wherever possible. We can justifiably claim some of the credit for the beneficial results obtained and take particular pride in our part in the improved performance which is so important to our country and to our railroads at this time.

The Methods of Water Treatment

There are a number of ways to handle water treatment and the selection of any particular method at a certain location or in a certain district is determined by the character of the water and the rate of consumption. The recognized methods are: (1) Lime, soda-ash, sodium-aluminate treatment; (2) wayside application of internal treatment; (3) exchanger process treatment; (4) boiler compound.

The first two methods are most prevalent in the United States and the choice is largely a matter of economics. The lime, soda-ash and sodium aluminate treatment is essentially a complete external cold-process treatment that can reduce the hardness of boiler water to approximately one grain and provide a good clear boiler water with reasonable excess alkalinity. This treatment is usually followed up with some type of after treatment to control after precipitation and provide protective materials in the boiler water for the prevention of pitting or corrosion in the boilers. These materials are also recommended for the prevention of intercrystaline cracking as covered by previous reports to this association. This method of treatment provides excellent results and, wherever the character of the water together with the amount of water consumed, warrants the relatively large plant investment, the railroads get adequate return on their investment in improved boiler performance.

Many installations have such water of such low hardness or deliver such small quantities of water that it is more economical to provide for the so-called wayside type of treating plant. This method provides means for introducing chemical to the wayside water supplies either on the way to the storage tanks or into the water on its way to the locomotive tender. Existing water pumping and storage facilities are usually not disturbed. The installations are made with low capital expenditure and the results obtained are considered to be comparable with the lime-soda method.

The exchanger type of treatment is used in certain cases where the character of the raw water supplies permits. The ordinary salt regenerated type may be used where the alkalinity ratio of the product water is satisfactory. There are some locations where this type of equipment can be used, but its application is limited.

More recent developments in this type of equipment

Dearborn Concentrometer—An a.c. electric conductivity measuring instrument for the determination of total dissolved solids

* Abstract of a committee report prepared for the Master Boiler Makers' Association. The full text of the report will appear in the 1942 year book of the Association.

combining acid and salt regeneration to control the alkalinity of the product water have not found application in railroad work as yet, but we understand these are being tried.

A still more refined type of exchanger treatment consisting of two filter beds in series, one regenerated with an acid and the other regenerated with either soda ash or caustic soda, has had some applications, particularly for producing water comparable to distilled water for use in train-heating boilers. This method appears to be too expensive for general locomotive water treatment application, although it has been entirely successful in treatment of water for the train heating boilers.

With all exchanger type treatments the product water is very corrosive and correct amounts of suitable after treatment must be added if severe pitting is to be avoided. This matter is apt to be overlooked in considering these types of treatment.

Still other treatment means are to be found in the various proprietary boiler compounds that are available. Usually these are used for some special purpose such as the control of a bad foaming condition or some such unusual condition. There are conditions in certain localities that call for special treatment, but in the main water treatment of the first or second type appears to take care of the majority of the cases and the methods and treatments are pretty well standardized at this time.

Controlling the Amount of Blowdown

With any of the standard methods of treatment there are certain fundamentals that must be understood and followed in operating the locomotive boilers if maximum benefits are to be obtained from the water treatment. Boilers that are rendered scale-free due to the treatment of the water supplies are capable of greatly increased output and, furthermore, they can be kept in service much longer between boiler washes if correct control is exercised over the matter of blowdown.

With correctly treated feedwater we have a boiler water that has a certain amount of highly soluble matter and a certain amount of insoluble sludge, all in circulation. As water is continuously evaporated into steam, the soluble salts and the sludge are left behind. If nothing is done about this, the concentration keeps building up in the boiler until eventually the boiler water will foam and cause carry-over with the steam.

Equipment has been developed to determine accurately how much blowing must be done in any given district to control the build-up of concentrations within a safe maximum so that the correct amount of blowdown can be determined without wasting fuel or water by excessive blowing. Once the correct blowing schedule is determined, it must be enforced as that is one thing that needs everyone's attention. It is too easy to lapse into forgetfulness on blowdown and let the other fellow take care of it. This is particularly bad in long engine runs as any individual engineman may be able to get by with little or no blowing, but his partners on down the line have to pay the penalty for his neglect.

Fortunately, the same means that determines the correct amount of blowdown in the first place can be relied upon to keep a check on individual performance. Samples of boiler water can be taken at each terminal and a quick check in the test equipment will show up the condition of the boiler water immediately insofar as any foaming tendency is concerned. Some railroads make a practice of posting these readings, called T.D.S. readings, for total dissolved solids, on the bulletin board at each of their terminals together with the engine number and the engineer's name. A great deal of interest in the subject of blowdown is thus created with benefit to all.

National Nalcometer for the electric determination of total dissolved solids in boiler water

Equipment for making these tests is shown in illustrations. The Nalcometer and Concentrometer make use of the electrical principle and are reported to be very accurate and provide speedy means of determining T.D.S. Other equipment is available which determines the T.D.S. by the density of the solution, but these are somewhat slower than the electrical methods, although they can be used within their limitations for an indication of the amount of blowing required.

Road Blowing

Blowing is handled in many different ways depending on the requirements. Where feedwater conditions are favorable, road blowing may not be required and all blowdown can be handled at the terminals. With long runs, however, passing through many districts, it is usually desirable to have at least some of the blowing done on the road, and this may be accomplished by adhering to a schedule of blowing through hand-operated blowdown valves. The schedules are often set up to blow a certain number of seconds each 10 miles on each side.

Road blowing has the advantage of giving a good control of sludge concentrations. The circulation in a boiler is rapid enough that sludge particles are usually pretty well dispersed throughout the boiler. Therefore, blowing on the road while the sludge is in suspension will remove a proportionate amount of this sludge from the boiler for each pound of water blown out. This holds true wherever good blowing practice is followed. Of course, if blowing is neglected there will be too much sludge in the boiler for the water circulation to keep moving and that is when mud banks are formed. Mud banks can usually be prevented by proper water treatment and correct blowing procedure.

Some roads do not wish to rely on manual blowdown and prefer some automatic means. The Automatic Continuous Blowdown, furnished by the National Aluminate Corporation and Electro-matic blowdown equipment furnished by the Dearborn Chemical Company have both been used to provide automatic control of the blowdown.

Terminal Blowdowns

Regardless of the type of road blowing followed, it is probable that there will always be a need for check-up

(Continued on page 526)

Reducing

A Hazard of Derailments*

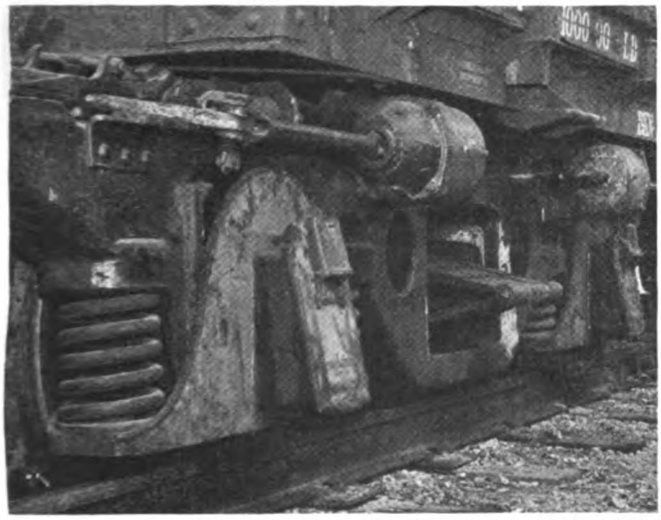
By L. R. Schuster†

Safety guide, developed on the Southern Pacific, functions to prevent jackknifing of derailed passenger trains by holding the cars in line with the track

In the summer of 1939 the streamliner City of San Francisco was derailed by a saboteur near Harney, Nev. This was a very disastrous wreck, causing considerable loss of life, many injuries and enormous property damage.

The circumstances surrounding this derailment, as developed by investigation, were briefly these:

The train was on a curve approaching a bridge across the Humboldt river at about 60 miles per hour when it encountered a misplaced rail. That is, the receiving end of the rail on the outside of the curve had been moved in several inches toward the center of the track and spiked there in such a way that the locomotive would be expected to derail immediately and head into the canyon.



A derailed truck of the test car showing the engagement of the rail by the safety guides

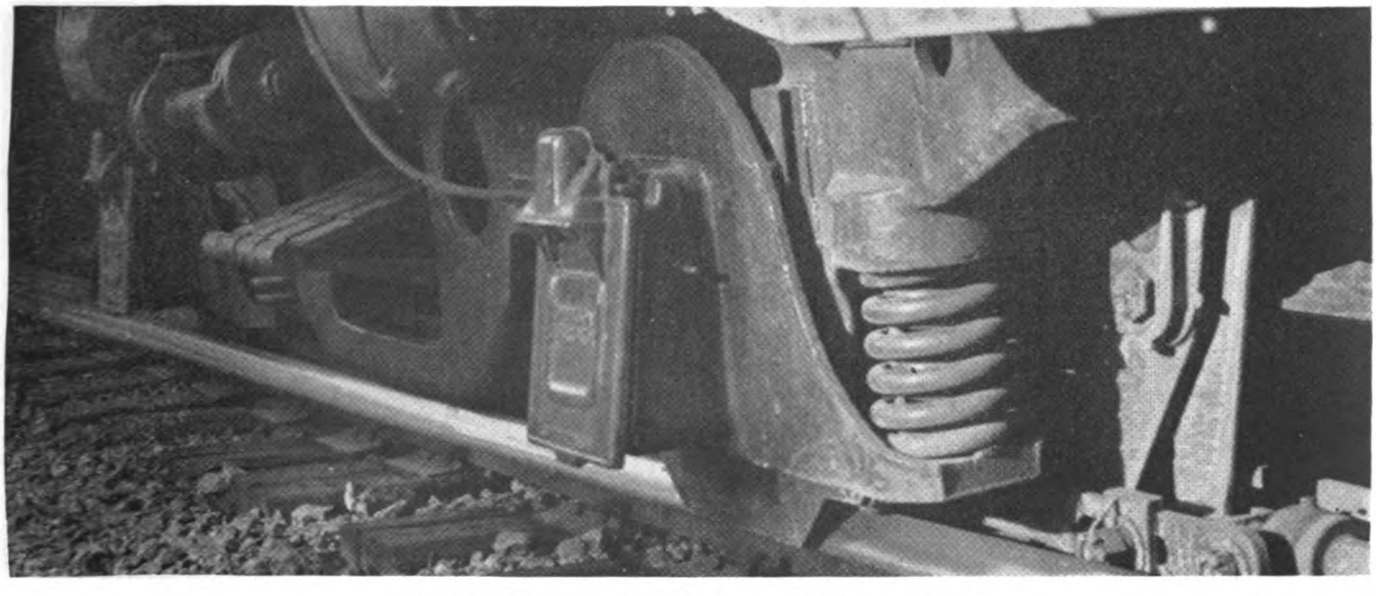
But the Diesel locomotive, while it left the rails at that point, still continued on across the bridge. The trailing cars followed the locomotive until the cars swung out of line sufficiently to contact and tear down the bridge superstructure, causing complete collapse of the bridge. It was this action that resulted in the major portion of casualties and destruction of equipment.

What kept the power units in line with the rails for such an unexpected distance beyond the point of derailment?

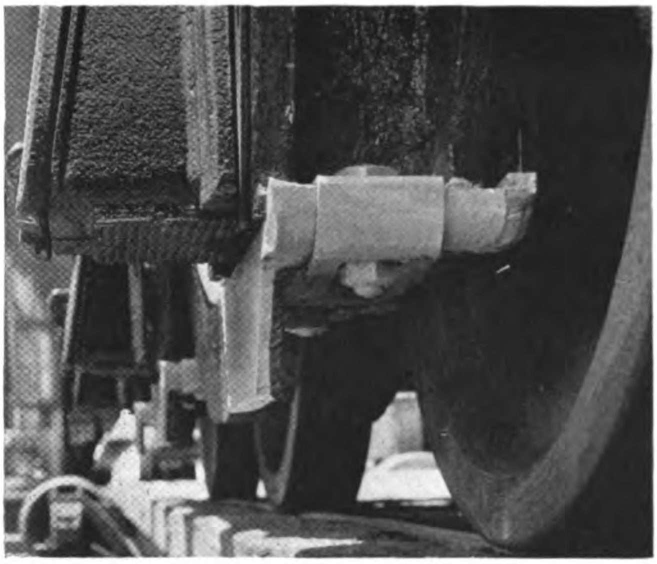
The answer was found in examining the trucks of the power units. Diesel-electric locomotives are provided with large traction motors on the axles which drive the train through a pinion and gear. Examination disclosed that, after derailment, the rail was engaged in a small space between the motor frame and gear case, which acted as a skid and prevented the trucks from getting out of line with the rail. Aiding in this action were the bolts and nuts securing the binder bars to the bottom of the truck pedestals. Worn and burned marks on these bolts and nuts showed that they bore against the

* Abstract of a paper read before the September 10, 1942, meeting of the Pacific Railway Club, at San Francisco, Calif.

† Engineer of car construction, Southern Pacific.



How the safety guides functioned on a rail which overturned



Application of a safety guide to the pedestal of a conventional six-wheel equalizer-type passenger truck

ball of the rail for at least part of the distance and materially assisted in keeping the locomotive parallel with the track.

The City of San Francisco derailment pointed definitely to the need for an additional safety device for trailing cars, since the performance of the power units gave an inkling of what might be developed.

We knew that the materials from which the cars were constructed were the finest obtainable. Design strength was greater than many of the heavier conventional cars and the most up-to-date safety features had been incorporated in the design. Two of these safety devices which are of particular importance in derailments are the tight-lock coupler and the bloster locking center pin. The tight-lock coupler is so designed that the knuckles will not slip by even if the cars are derailed and this is an effective safeguard against telescoping which produced disastrous results in accidents in the past. The bolster locking center pin serves to prevent the truck from coming out from under the car, which usually happened with the old type of center pin.

Tested Under Severe Conditions

Both of these devices did a very find job in the City of San Francisco derailment. The trucks of the two cars turned over down the embankment were still attached to the car bodies and the first five cars were still coupled.

It was apparent then, that if some practical means could be provided to keep trucks from sluing or turning crosswise under the car, one of the principal hazards in derailments would be very materially overcome. Such a device has now been developed and applied to a large number of cars throughout the country. This device is called a Derailment Safety Guide‡ and in the short time it has been in service has had several opportunities to prove its worth. It is simple in construction, adds very little weight to the equipment and in some applications, principally on passenger-car trucks, takes the place of the usual pedestal tie bar or binder. At its outside edge, when applied to the pedestals of outside journal boxes, is a vertical flange which is designed to extend down to a minimum distance of 4½ in. above the plane of the top of the rail when the wheels are new.

When a wheel drops to the ties and moves slightly to the side, the flange engages the ball of the rail and prevents further side movement. Its action then is to skid along the rail and keep the truck in line with the car body. It is this action that eliminates the chief cause of jackknifing with its resultant damage to equipment and increased liability of injury to passengers.

Tests of Derailment Safety Guides

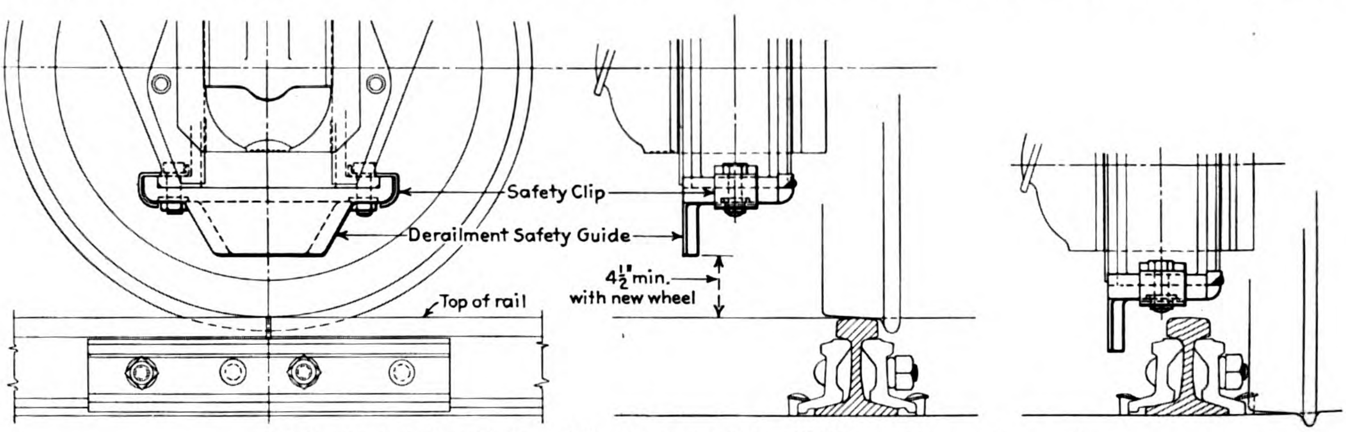
Before applying any of these safety guides to Southern Pacific cars, several tests were conducted in which the test car was actually derailed. For these tests a flat car was fitted on one end with streamline type of passenger-car truck equipped with Derailment Safety Guides and the car was partially loaded with rails to simulate service conditions. The opposite end had a standard freight-car truck.

Four tests were made in this instance at speeds of 10, 20 and 30 miles per hour and were accomplished by either pulling or kicking the car over a standard portable derailer except in the case of the third test. In this test, one end of one rail was moved six inches toward the center of the track to create a condition similar to that which derailed the streamliner City of San Francisco and the test car was kicked from the end of the train at a speed of approximately 20 miles per hour.

One of the photographs shows the derailed truck with the guide flanges firmly pressed against the rail.

Another illustration shows the position of the generator bracket on the end of the truck frame. In a derailment of this nature, brackets of this kind are very liable to contact angle bars or other track fastenings and cause the truck to slue.

The fourth test in this series was made by cutting



Details of a typical application of the Derailment Safety Guide on a passenger-car truck

‡ Patent on this device is held by George McCormick, formerly general superintendent of motive power, and B. M. Brown, general superintendent of motive power, Southern Pacific.

off the test car at a speed of approximately 30 miles per hour on a 12-deg. curve. A standard movable derailer was used and the car traveled a distance of 75 ft. after derailing. The truck equipped with derailment safety guides was held to the rail for the full distance traveled. In the photograph taken after this test note how the front truck is in line with the track while the rear truck, not equipped with the safety device, moved over until the wheels on this side were against the opposite rail. The rear wheels of the front truck did not derail although they passed over the derailer. This indicates that the safety guides on the front pair of wheels held the truck sufficiently in line to cause the rear wheels to drop back on the rails. In one of the other illustrations the generator bracket on the truck was shown. At the extreme left of this view it will be seen that one lug of this bracket is broken off due to the severity of impact during this derailment.

When we had studied and digested the evidence produced by these tests we arranged to apply derailment safety guides to all of our new type streamline cars, including the City of San Francisco. Our neighboring lines and the Pullman Company cooperated with us to the end that new Pullman cars placed in service in the Lark train as well as new Pullmans recently delivered for Overland and Golden State Limited service are equipped with this safety device.

Effects of Safety Guides in Derailments

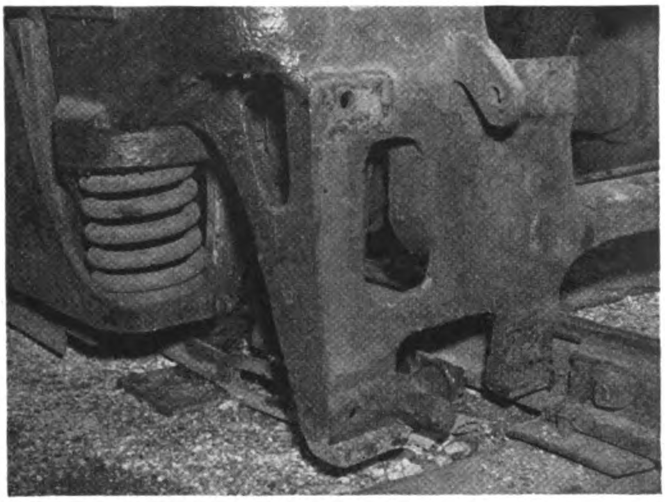
Derailments of passenger trains are not common, due to rigid inspection and maintenance of equipment and right-of-way. But sometimes they will occur and when the streamline Lark was involved in an unfortunate rear-end collision last September we were extremely thankful that this train was completely equipped with safety guides.

The standing Lark was struck from the rear by a fast merchandise train traveling at a speed of about 22 miles per hour at the time of the impact. The rear car was pushed to one side and practically destroyed by the impact and the locomotive of the freight train hit the end of the next car. Trucks of all but the first few cars in the train were derailed and there was a marked tendency for all couplings to jackknife. The safety guides, however, lapped over the rail as these trucks were derailed and prevented the cars from jackknifing; the lateral reaction was so severe that rails were turned over under the cars. A closer view of this is shown in one illustration. It will be seen that on one truck the flange of one safety guide has lapped over the ball of the rail and the other has caught the bottom flange of the overturned rail.

Results obtained with the derailment safety guides on streamline-type passenger equipment were so successful that we have extended the application of the device to many of the conventional type of passenger cars and also to a number of locomotives and tenders. Some 860 units of rolling stock have now been equipped.

Some of the other applications to various types of equipment are illustrated. In the application to a conventional type six-wheel truck safety clips have been provided, to prevent the guide bar from dropping in event of a lost nut or broken bolt. Also shown is a lug which bears against the back of the pedestal so that when force is exerted on the vertical flange, dependence is not placed entirely on the bolts securing the guide to the pedestals. Ends of the guide are also flanged up against the pedestal.

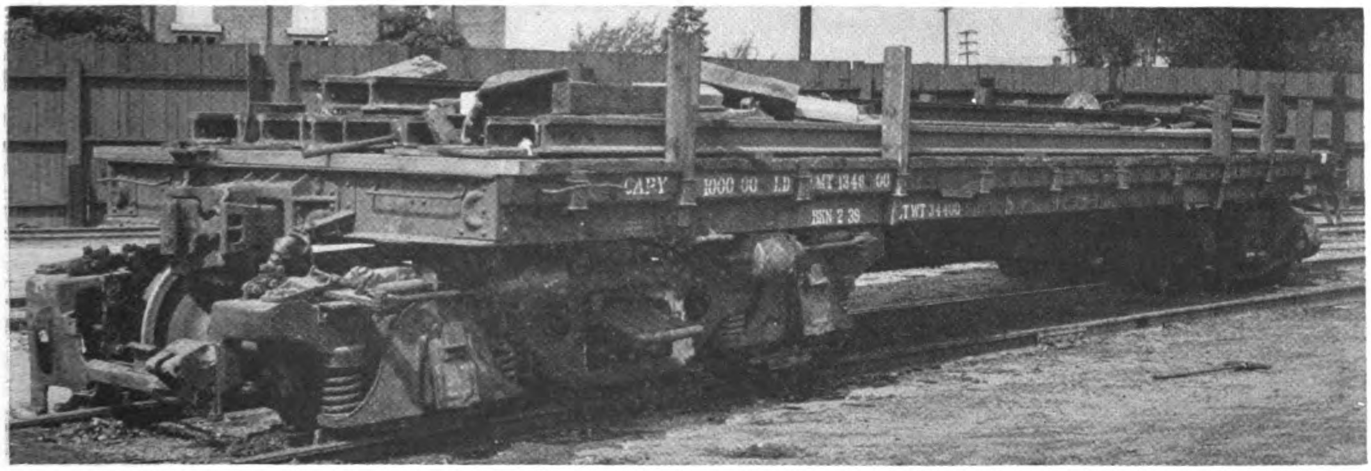
A short time ago the engine on one of our passenger



Projections like this generator bracket tend to slew derailed trucks by contact with angle bars or other truck fastenings

trains on the Coast route ran over a piece of pipe at a crossing, which caused the engine truck to derail. The train proceeded for a distance of some 900 ft. before being brought to a stop. The usual experience with engine trucks is that they turn crosswise or head away from the track when derailed and result in the engine turning over, or other serious consequences. In this

(*Continued on page 526*)



How the test car came to rest after a derailment at 30 miles an hour on a 12-deg. curve

Factors Which Make for

More Use of Motive Power*

By J. M. Nicholson†

The author sketches the history of the development of long locomotive runs and discusses the measures which are effective in reducing out-of-service time—New power and more intensive use both required for 1943

The utilization of locomotives is a phase of railroad operation that has been studied consistently for a considerable period of years. It has grown to major importance in the last generation, and is now a very vital subject in handling the transportation being offered to the American railroads.

In the period 1918 to 1920 the practice was inaugurated of extending locomotive runs over more than one engine crew district, giving the locomotive servicing attention at the intermediate point, and either running it through the terminal on the same train, or relaying it to the next following train. The usual practice was to give the locomotive such repairs at the turnaround terminal as were necessary to get it back to the maintenance terminal. Heavy, running repairs were handled at the maintenance terminal, which was usually on one end of the run. After a few years of this operation locomotive runs were extended over two to three or four engine-crew districts, and by 1922 runs over four engine-crew districts in passenger service and three engine-crew districts in freight service were not uncommon.

In years following, this handling was built up to where steam locomotives in passenger service were operated continuously from 1,500 to 1,800 miles, and locomotives in freight service from 500 to 800 miles. Today very few through-freight or through-passenger locomotives are operated over but one engine-crew district, and in practically all through freight and passenger service the locomotives are operated on a program of extended runs which is worked out to give maximum utilization consistent with the service to be handled and the location of the terminals where heavy maintenance is performed.

Prompt Inspection on Arrival

In order to get rapid turning of power at maintenance terminals it is necessary to have sufficient forces on the second and third shifts in the enginehouse to be able to repair and turn the power arriving on these shifts with the same regularity of turning time that is experienced on the first shift. We found it necessary in order to speed up the movement to strengthen our second and third shifts. We insist that locomotives be inspected just as soon as possible after they reach the maintenance terminal or turnaround terminal at the end of the run. In 50 per cent of the cases the locomotive is inspected within one hour after its arrival at the terminal, and only in rare exceptions is the locomotive in the terminal more than two hours before it has been inspected by the roundhouse force. By making this inspection promptly after arrival of the locomotive at the terminal the enginehouse foreman can materially reduce the terminal time by servicing and repairing the locomotives first which have the minimum work to be performed; and by furnishing these locomotives first he can hold the locomotives the necessary time that require heavier work and still furnish the power required.

The usual terminal layout in existence that was established for locomotives on short runs involved an inbound and outbound track to the enginehouse, with fuel, water, sand and fire-cleaning facilities so located that it was necessary to stop at three or four different locations in order to supply the locomotive, and for servicing the locomotive it would require approximately thirty minutes' time with such facilities. This time, along with the time required to move from the train to the roundhouse and get back from the roundhouse to the train and make the air test, in many cases was greater than the time required to switch the freight train. In order to relieve this condition, made necessary by running locomotives through terminals, and arrangement of facilities in many cases has been provided where the locomotives are supplied fuel, water, and sand, and given fire-cleaning attention at one spot, pits being provided for handling underneath inspection and replenishing of driving-box grease if necessary, with the result that the roundhouse delay for inspection and servicing is being handled in ten minutes. During this time the outbound engineman is oiling the engine around and making his inspection.

In switch service each terminal assignment is analyzed and such switch tricks as possible are grouped so that the locomotive will work three consecutive tricks before being turned into the enginehouse for repairs and servicing attention. Further analysis is made to group all of the tricks possible so that the locomotive will work two consecutive switch tricks, and such tricks as cannot be grouped are worked by turning the locomotive into the enginehouse after each trick, and after giving it necessary attention it is placed on another following switch trick.

Minimizing Out-of-Service Time

In order to get maximum utilization from locomotives it is necessary to reduce to a minimum the time of handling enginehouse maintenance, and reduce intermediate terminal servicing time as well as turnaround terminal time. It is equally as important that the time of handling classified repairs be reduced to a minimum. The usual practice prevailing for many years in the handling of classified repairs is to work back shops and general repair shops eight hours per day, and six days per week. This program has been modified at all of the

* Abstract of a paper presented before the Western Railway Club at Chicago on November 16.

† Assistant to the operating vice-president, Atchison, Topeka & Santa Fe.

Santa Fe general shops, also in many of the shops where class four or class five repairs are made, by having a second shift which carries on classified repair work 16 hours a day instead of eight hours, resulting in a very substantial decrease in out-of-service days for locomotives receiving classified repairs. We have found that second-shift operation in repair shops on classified repairs has resulted in reducing the out-of-service days approximately 40 per cent.

The activities carried on by the second shift are confined largely to the tight spots in the particular shop involved, such as stripping-gang work, boiler work, machine work, and floor work. These men on the second shift are used to expedite the particular character of work that is holding back the output of the shop, and their activities are changed to meet the particular conditions existing.

The percentage of power out of service on the Santa Fe for general repairs, consisting of class three repairs and heavier, is ranging from three to four per cent of our ownership. Locomotives out of service for class four and five repairs are also ranging from three to four per cent of the total ownership.

We have made numerous studies of the time steam freight locomotives are in service, time undergoing repairs, and time waiting for train after repairs are completed, which show for a 24-hour period an average of approximately 12 hours working, 8 hours undergoing repairs, and 4 hours waiting after repairs have been completed. On passenger locomotives the hours working and hours undergoing repairs are approximately the same as for freight service, while on switch locomotives the hours working are approximately 16 per day.

A recognized unit for measuring utilization of locomotives is the miles made per active locomotive per day or per month, which takes into consideration all active locomotives and does not include those that are stored serviceable. With present operations on most railroads, no through freight or passenger power is now stored serviceable, and this has resulted in using as a yardstick in some cases the average mileage made for all locomotives assigned for various extended locomotive runs. On this basis, all locomotives in the extended-run assignment are included regardless of whether they are in the shop for general repairs, in the roundhouse, or working.

On the basis of average miles per active locomotive per day, the Santa Fe for the month of July, 1942, averaged a total of 318 miles per day for all locomotives in passenger service, a total of 167 miles per day for all locomotives in freight service, and a total of 94 miles per day for all locomotives in switch service.

Extended Schedules on Practically all Through Runs

At the present time on the Santa Fe approximately 95 per cent of all through freight and through passenger locomotives are operated on extended locomotive run schedules over two or more engine-crew districts. In July of this year the principal classes of through-freight steam locomotives averaged 6,166 miles per locomotive for the 418 locomotives assigned. The highest mileage ran on the system in this service averaged 9,015 miles per locomotive assigned. In steam passenger service the average was 9,928 miles per locomotive for the 129 locomotives assigned, and the highest mileage made on any individual run averaged 15,382 miles during the month of July. These figures are quoted on the basis of locomotives assigned, regardless of whether they were in the shop for classified repairs, in the enginehouse for running repairs, or actually in service. The maximum mileage made by any individual steam freight locomotive was 10,397 miles during the month of July, and the maximum mileage made by any individual steam passenger locomotive during the same month was 20,290.

The Santa Fe, along with other western roads, is confronted with a problem of using as boiler water for locomotives the water which is available in this territory. The water available is considerably higher in sulphates and carbonate salts which produce scale, and also in alkali, than is water in other parts of the United States. Twenty years ago it was the practice to wash boilers after about 500 miles of service, and most of the water was treated with lime and soda ash wayside treatment. The treatment of water has been improved, and today many of these locomotives are being operated thirty days between washout periods due to the improved water treatment and the blowing out of boilers as regular intervals to relieve the concentration and sludge accumulations in the boiler. Locomotive boilers today are being operated at a higher rate of evaporation per square foot of heating surface than in former years, and with a reduced amount of foaming and priming; and this has materially reduced the time required to perform the necessary running repairs at maintenance terminals.

Another major factor contributing to improved utilization of locomotives in present-day operation is the improved lubrication of all parts of a locomotive. A higher quality of engine oil, valve oil and grease has been developed in order to meet the high-speed service that is now required. Mechanical lubrication of valves and cylinders, engine trucks, shoes and wedges, guides and trailers has contributed to reducing hot-bearing trouble enroute. It has also contributed to reduced maintenance in enginehouses for such operations as renewing cylinder packing and valve rings, rebabbitting cross heads, changing engine-truck and trailer wheels, hot driving boxes and hot pins.

Roller Bearings Reduce Maintenance Work

Roller-bearing driving boxes, engine-truck, trailer and tank boxes, have also materially reduced maintenance work on these parts. We have two Mountain-type passenger locomotives equipped with roller-bearing rods that have been in service now for about one year. Performance to date indicates that less maintenance time is required with the roller-bearing rods.

Diesel locomotives are being used in freight, passenger, and switch service to the extent of 7 per cent of the total gross ton miles for the system in freight service, 13 per cent of total car miles for the system in passenger service, and 17 per cent of the total switch locomotive miles. The average miles of Diesel freight locomotives assigned for the month of July this year amounted to 11,056 miles, for Diesel passenger locomotives 17,117 miles, and for Diesel switch locomotives 4,125 miles. Diesel switch locomotives were working 92 per cent of the hours in the month. It is the practice to give preference to the use of Diesel locomotives where both steam and Diesel locomotives are assigned, in order to get maximum utilization out of the Diesel locomotives, which results in some loss of mileage to steam locomotives with this handling.

New Power and Intensive Use Both Required

Ralph Budd made the statement predicting an increase in traffic in 1943 of 15 per cent over that for the year 1942, and it was his judgment that the railroads would require 1,000 more locomotives and 100,000 more freight cars in order to handle this increased traffic safely.

One thousand more locomotives, divided between passenger, freight, and switch in present ratio, would mean an increase in ownership of between 2½ and 3 per cent. These locomotives would be of the latest type and it would be safe to assume that they should handle between 1½ and 2 times the amount of tonnage of the average locomotives now owned in freight service, so that this relief would probably take care of from 4 to 6 per cent of this increase in traffic. The remainder would have to be taken up by more intensive utilization of present locomotives. This would mean that the locomotives must be utilized more intensively, handled to and from roundhouse promptly at intermediate terminals, and the time for servicing at roundhouses and repairs in back shops would have to be further reduced.

Utilization of locomotives as measured by total miles per locomotive month, or by hours worked per month, at the present time is the greatest that has ever been secured, and the study being given improved utilization is greater than it has ever been. This in part is due to critical material not being available to secure new steam or new Diesel locomotives readily, and also due to a large part of the locomotive builders' facilities being used on defense work. This has made it necessary that the railroads in many cases handle the increased business now being offered with the power which they now have. I feel safe in saying that further improvements can, and will be made.

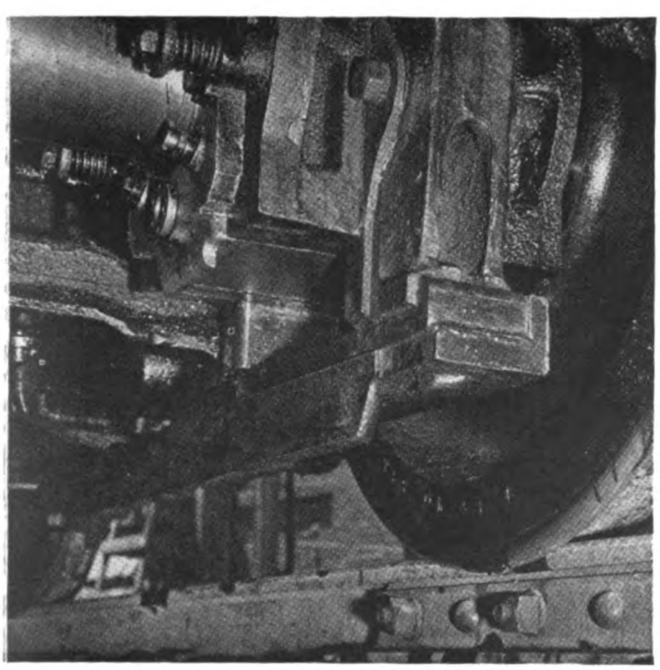
Reducing a Hazard of Derailment

(*Continued from page 523*)

case, however, the safety guide held the truck in line with the track and as a result, no damage was sustained by the engine or other equipment in the train.

At El Paso, a tender was being moved onto the turntable and due to improper alignment of the table, the tender was derailed. Under ordinary circumstances derailment of this tender in all probability would have caused a considerable delay. But the safety guides with which it was equipped, held the tender in line with the track so that only the front pair of wheels were derailed and the tender could be rerailed with a minimum loss of time.

We had a derailment in West Oakland yard of two of the Diesel power units from the City of San Francisco. As in cases involving trailing cars, it was found that the safety guides with which these power units were equipped, lapped over the rail as expected. Notwithstanding the fact that the speed at time of derailment was not more than 10 miles per hour, the lateral force exerted on the tie-bar flanges was sufficient to turn the rail over. The safety guides came through this ordeal with only minor abrasions; however, their action in keeping the power trucks in line with the track assisted materially in rerailing these heavy units.



An application of safety guides on an engine truck with inside journal bearings

Methods of Systematic Treatment of Feedwater

(*Continued from page 520*)

at the terminals and for some terminal blowdown as such checks may show to be required. In such cases certain general rules or procedure need to be followed.

Freshly injected water is cooler, hence heavier, than water at the temperature of steam in the boiler. It will, therefore, go to the bottom of the boiler due to its greater density. If the blow-off cocks are open while the water is being injected or immediately after it has been injected, a large amount of this freshly injected water is apt to be removed which does not materially improve the boiler conditions and represents wasteful practice.

Good terminal blowdown procedure is to maintain a brisk fire during this operation to insure good circulation in the boiler. The boiler is filled with water and after a short wait to make sure the fresh water is thoroughly mixed with the boiler water, the blow-off cocks are opened until a glass of water is blown out. If more than one glass of water must be removed, the procedure is repeated until the T.D.S. is reduced to the required figure. On each individual road the proper amount of blowing can be figured for each class of power based on incoming T.D.S. figures. Knowing the amount of water contained in the boilers of each class of power and the amount of water capacity from the bottom to the top of the water glass, it is a matter of simple mathematics to determine the reduction in T.D.S. for each glass of water removed. This information can be compiled and posted on a chart so that the people responsible for terminal blowing will know how much water should be blown out of the boiler for any given T.D.S. reading.

The report was signed by J. P. Powers (chairman), system boiler inspector, Chicago & North Western, Chicago; H. E. May (vice-chairman), shop engineer, Illinois Central, Chicago; S. P. Mahanes, district boiler inspector, Chesapeake & Ohio, Clifton Forge, Va.; I. N. Moseley, general boilermaker, Norfolk & Western, Roanoke, Va.; W. B. Graham, chief mechanical inspector, Gulf Coast Lines, Houston, Tex.; C. R. Kirkwood, boiler foreman, Cleveland, Cincinnati, Chicago & St. Louis, Indianapolis, Ind.; R. E. Coughlan, engineer of tests, Chicago & North Western, Chicago, and V. E. McCoy, chief engineer, National Aluminate Corporation, Chicago.

EDITORIALS

Diesel Crankshaft Shows Record Wear Resistance

A Diesel passenger locomotive which recently completed about one million miles of service was sent to the shop for thorough inspection and repairs, and an examination of the crankshaft showed wear on the bearings to be only .001 in. This unusual record of crankshaft performance is credited to the electrical induction method which was used for hardening the metal in the bearing surfaces. In this process the limited areas which it is desired to harden are heated by means of a magnetic flux set up by electric coils surrounding the surface, and the depth of heating is controlled by the magnitude of the electric current and the time it is allowed to flow. When the specified heating has been supplied, the bearing surfaces are quenched and given greatly increased wearing properties without altering the physical characteristics required in other parts of the forged crankshaft.

The crankshaft bearings are given the desired selective surface-hardening treatment by means of tunnel-line electric-induction equipment with the necessary electrical generator, control board and other details conveniently arranged so that the crankshaft can be easily worked on. Although the equipment used to harden locomotive crankshafts is somewhat different from that required for smaller parts, the same principle is utilized The process should be adaptable to other locomotive parts such as axles, crank pins, piston rods, etc. It is at present being widely employed in hardening smaller motor parts, gun bolts, tank sprockets and track pins, armor-piercing shot, aircraft assemblies and thousands of other war production parts.

The Proper Care Of Machine Tools

The present difficulty in securing replacement of worn machinery in railway shops and engine terminals re-emphasizes the necessity of giving the machines now in service the best possible care in order to minimize wear and extend their service life as much as possible. Good machinists and mechanics are known by the care given to tools which they use and, by the same token, machine shop foremen and supervisors are definitey responsible for the mechanical condition of all machinery and tools located within their respective departments.

Some railroads have been giving special attention to this subject for a number of years and, in an endeavor to stimulate the interest and pride of machine tool operators, have had their names shown on suitable name plates which are secured to the head stocks of the individual machine tools which they operate. Another method which suggests itself would be to offer a small prize, or honorable mention on the shop bulletin board, for the operator in each department who keeps his machine in the best condition, the award being made by a committee representing both the shop management and the machinist's organization, also possibly the general tool supervisor for the railroad.

Two unusually instructive and well-prepared bulletins, recently issued by an engine lathe manufacturer, contain a great deal of information on the highly important subject of keeping lathes clean and seeing that they are properly lubricated. There is no question that any reasonable amount of time expended in cleaning an engine lathe, like other types of machine tools, will be repaid many times over by increased accuracy, higher production, easier operation and longer service life. Scale, grit and fine chips, in conjunction with oil, form an abrasive which must be prevented from getting between all bearing surfaces if satisfactory results with the lathe or other machines are to be secured. Frequent and careful chip disposal are essential.

The general methods and equipment required for the proper cleaning of shop machinery are, of course, well known and yet need to be constantly brought to the attention of new machine operators and also to more experienced men who may become careless. Brushes of one kind or another are convenient for removing loose dirt and chips and are preferable to blowing with compressed air which has a tendency to force the abrasive dust into oil holes and between bearing surfaces. After brushing, it is a good practice to get rid of the last traces of grit and dust by means of a clean cloth, preferably slightly oiled to prevent the formation of rust on the highly-finished machine surfaces.

A small bottle brush is conveniently used for cleaning taper holes, but here again the final operation should be done by means of an oiled cloth. Spindle threads need to be thoroughly cleaned and oiled before application of a chuck or face-plate, also lead screw threads, both of which can be cleaned either by a brush or application of a cord as the screws are revolved. It is obvious that the threads in face-plates or chucks, and the taper shanks of lathe centers and drill chucks should receive the same careful attention if these parts are expected to run true and not stick when assembled in place. The need of proper cleaning of the compound

rest and tool-post assembly before setting up a new job is self-evident. The lathe should also be protected from abrasive dust in any tool-post grinding operations which may be attempted. In this connection, more or less elaborate dust exhaust systems, or small cups of oil located below the grinding wheels and arranged to catch dust particles, are quite effective and justify the small cost which may be involved.

It is very important that cleaning and oiling with the proper grade of lubricant be done at least once a day—more often in the case of multiple-shift operation. Too much stress cannot be laid on the necessity of using the grade of lubricant designated by the manufacturer on each bearing surface. Some bearings are so closely fitted that the machine oil must be diluted with kerosene for suitable lubrication, and the results of attempting to operate this part of the machine with an improper grade of oil can readily be imagined.

Shop men, like all others, are creatures of habit and, with the proper effort, machine-shop foremen and tool supervisors can induce machine operators to adopt the highly-desirable and profitable habit of inspecting, cleaning and oiling their machines at stated periodic intervals. In this way, accurate work, high production and maximum service life of the machinery are assured.

A Gloomy Outlook

The railway equipment authorizations announced by WPB on November 19 have been received with mixed feelings by railway managements. They might have been worse but they certainly are nothing on which to base an optimistic view of the transportation situation in 1943. The eight months' authorizations for 250 steam locomotives and 36 road Diesels and the six months' authorizations for 100 Diesel switchers, projected forward for the full year, would indicate a 1943 locomotive building program of 629 locomotives, about 425 of which will be available for freight service. The freight-car program, similarly projected, indicates additional cars amounting to just one-half of the 80,000 for which formal request was presented.

All records for motive-power utilization have been broken during 1942. For the month of August, the last for which the figures are available, 62.4 billion net ton-miles were handled in 58.3 million freight-train miles with 67.4 million road freight-locomotive miles. Net tons per train were 1,086 and gross tons per train 2,366. This movement was handled with an assignment of 24,358 locomotives, an average of 89 miles per day for all locomotives on line. In August, 1941, net tons per train amounted to 990 and gross tons per train to 2,223. The 24,425 locomotives then on line produced 49.2 billion net ton-miles in 50.3 million freight-train miles with 57.4 million road freight locomotive miles, an average of 76 miles per locomotive day for all locomotives on line.

An increase of 15 per cent in ton-miles has been estimated as probable during 1943. Such an increase will undoubtedly produce months in that year at least 15 per cent greater than the month of August, 1941. If no month in 1943 were greater than that, then in such a month there would be produced 71.8 billion net ton-miles. Assuming a further increase in train loading in 1943 equal to that of 1942 over 1941, the gross tons per train would be about 2,500 and, with the same ratio of net to gross train load as in 1942, the net tons per train would be 1,145. With such a train load 62.7 million freight-train miles and 72.7 million freight locomotive-miles would be required. Adding a net increase of about 325 locomotives within the year (425-100 locomotives scrapped), the 24,684 locomotives assigned to freight service would have to average 95 miles per day to produce these results—a six per cent increase in the intensity of locomotive utilization.

How far will 40,000 new freight cars go toward meeting the needs of 1943? No doubt there will be some relief in the open-top situation, but considered as a whole, about 10,000 of the new cars will be required as replacements and the 30,000 net increase will be a little more than one and one-half per cent. The records of freight-car performance established this year, then, will have to be exceeded by about 13 per cent. Net ton-miles per car day will have to increase from 994 as in August, 1941, to 1,123. This means either that car-miles per car day must increase from 49 to 55, or net tons per loaded car from the high record of 32.7 in August, 1941, to 37, or some combination of the two. In all probability most of the increase will have to be in miles per car day, since the effect of heavy l. c. l. loading is reflected in the increase of 2.8 tons per loaded car from last year. No such marked effect is likely to occur soon again.

Are such increases in utilization possible? There are those who a year ago would have said that the increases made during the past year were impossible. It is, however, dangerous at this time to assume that such increases can go on indefinitely. In the first place, maintenance will have to be continued to high standards without any recession from the present high percentage of all locomotives and cars in serviceable condition. But, the railroads are only beginning to feel the pinch of manpower. There is now talk in Washington of expanding the armed services up to 9 million men. This is about one-fifth of the male population between the ages of 17 and 64, and more than a tenth of all population between these ages. One estimate out of Washington is that it takes 18 men at home to keep one armed man in the field. This would call for a working population upwards of 20 million greater than our present total population of all ages. Such figures are evidence of the chaos in the thinking among government agencies involved in the prosecution of the war. From all of this muddle no one can say how far the railways may be compelled to get along without or to replace present manpower.

There is a growing recognition in many places—

some of them even in Washington—of the vital part the railways are playing—and must continue to play—in the successful progress of our war effort. Unfortunately, they are still officially regarded as merely one of the many civilian industries and activities, all of which are lumped together into one of the seven claimant agencies recognized by WPB in its new C. M. P. plan of controlling the flow of critical materials. Thus, ODT must compete with the whole field of civilian needs, through its "industry branch" of WPB for whatever it gets in the way of materials and equipment for the railway and not with the other six war agencies as it properly should.

If no greater understanding of the key nature of transportation is shown in dealing with the manpower problem than is being shown in dealing with the needs of the roads for motive power and rolling stock, the outlook for 1943, is, indeed, not optimistic.

Will the Back Shop Be the Bottleneck?

Estimates of an increase in traffic during the next year of approximately 15 per cent cannot help but be a cause for some serious thinking on the part of those who are charged with the responsibility for providing the motive power with which that traffic must be handled. Every railroad man in the official and supervisory ranks of both mechanical and operating departments probably is asking himself, at this moment, "Where are we going to get the locomotives?" As matters stand there are three places from which the motive power needed by American railroads can be secured—from the builders, in the form of new locomotives, from the back shops of the railroads of this country, in the form of restored locomotive mileage or from an increase in the utilization of power while it is on the road.

There is no need to waste many words here in discussing the question of new locomotives as a source of help, for the War Production Board having decided how many locomotives the railroads need consistent with production capacity and available materials has made public its authorizations of new power to be built. Whether or not this new power will meet the railroads' need is something which the future will demonstrate.

The utilization of locomotives in road service is now at the most intensive stage that it has ever been in railroad history and it augurs well for the future to know that there never was a time when operating men devoted as much study to the problem of improving utilization as they are doing right now. Coincident with the efforts being made by operating personnel to extend to the limit the daily mileages of motive power units there is also a real accomplishment being made in turning power at terminals.

Aside from these considerations there is a growing feeling on the part of mechanical men that the back shop may soon become the bottleneck of the motive power problem. In the effort to get the last mile of service out of a locomotive at the high operating speeds prevalent today, it is only reasonable to assume that, as time goes on, the locomotives that arrive at the shop for general repairs are requiring more man-hours of labor and more dollars' worth of material to restore them to service. If this is true, those having the responsibility for the operation of our back shops are confronted with the necessity of doing a heavier repair job on each locomotive while facing (1) a demand that the locomotive be returned to service in the shortest possible time; (2) an increasingly difficult situation with respect to materials and parts and (3) a shortage of man power.

In a situation such as this, those responsible for shop operation can approach the solution to a demand for greater output either by increasing the number of shop hours worked; by increasing the number of men on each shift; or by increasing the productivity of the available facilities of the shop. Unfortunately, the first and second of these three courses require something that is not readily available—additional man power. The first of the two courses can be solved, without recourse to the second, only by lengthening the working day.

When any consideration is given to the possibility of increasing the productive capacity of existing facilities, we come to one of the greatest handicaps with which railroad shops have contended for years—obsolete shop equipment. There are those in the railroad shop field who have justified the continuance in service of units of shop equipment far beyond the limits of their economic service life on the ground that these obsolete tools had productive capacity enough to meet the ordinary demands for shop output. A substantial increase in that productive capacity is now vitally necessary.

It is not necessary to go to great lengths to demonstrate the vastly superior productive possibilities of modern machine tools and shop equipment. The single example, in a certain shop, of six turret lathes which have not only displaced 13 obsolete turret lathes but have increased the output of that particular department to 150 to 200 per cent of its former production is a case in point. This example can be multiplied by as many times as there are similar installations in the railroad field. Added to this are the possibilities of new tools and tooling equipment which, in many cases, can increase the output of even the older machines.

If these things are true, why hasn't the railroad industry demanded its share of modern shop equipment in order to help play its part in the war effort? The answer to this question most frequently given to us is, "Why ask for something you can't get?" There is every reason to believe, at this moment, that any railroad company needing new machine tools or shop equipment may be able to get what they need if they will take the trouble to discover that some manufacturers of such equipment, who have been supplying defense plants, are now in a position to supply *some types of equipment* on reasonably short deliveries.

Is it not apparent that if you find out what can be had, and keep on asking for it, the chances are in favor of getting what you need?

THE READER'S PAGE

Two Ideas From a Boilermaker

To the Editor:

The Locomotive Boiler Inspection Law was put into effect in 1911. It gave the men responsible for the maintenance of the locomotive boilers prestige that they never received previously, and from that time on there was a noticeable improvement in boiler conditions, and a decided decrease in the number of boiler failures and accidents.

From that time until recently the boiler men had much to say relative to boiler appurtenances and their location, and also to the feed water used in the boiler and its treatment. This authority has been gradually taken away from boiler men on most railroads, and the result has been an increase of boiler accidents, and a great number of them have proved costly at this time in the loss of power in service, loss of life and loss of money.

After the locomotive inspection law was put in effect it was the practice of most railroads, when an explosion occurred, to call in the general boiler foremen or general boiler inspectors from other roads, to make a joint investigation, which quite often brought out facts, which may not have been published, but which were often used to prevent the reoccurrence of similar accidents. This practice seems to have been discontinued.

It is the writer's opinion that the large high-pressure boilers of today can be improved if proper consideration is given to circulation throughout the length of the boiler, instead of just around the fire box, as it has been known for years back by engineers and builders of stationary boilers that proper circulation which makes for equal temperature eliminates priming of the water in the boiler and prevents cracking and rupture of the boiler plate.

This writer has no patents or appliances to sell, but believes that better circulation can be obtained by the application of pipes from the bottom of the shell, back of the front flue sheet to the throat sheet. Where syphons are used these pipes could enter the throat sheet at the syphon washout plug openings.

A Master Boilermaker.

Instruments for Measuring Hardness

To the Editor:

Recently at one of the large railroad shops I ran across an instrument known as a scleroscope which was used for determining the hardness of steel. It was nothing more than a small cylinder having a plunger at one end and a hole at the other. A gauge was attached to the upper end of the cylinder. To operate, it was merely placed on the steel to be tested, the plunger forced down, and then released. After a delay of a few seconds, the needle of the gauge moved and registered the hardness. The whole operation was simple, rapid, and apparently exact.

I have made inquiries as to exactly how this instrument works. In your columns I wonder if you could explain the principle on which this device works?

R. T. Roberts.

[There are several different types of instruments for measuring the hardness of metals. The Brinell hardness number is determined by pressing a small hardened steel ball of standard diameter into the metal to be tested. The area of the depression and the pressure exerted are the factors from which the hardness number is determined. The Shore scleroscope consists of a small weight which falls through a glass tube to strike the metal to be tested. The striking end of the weight is very small so that the weight itself is large in relation to the area in contact with the material to be tested. The hammer is allowed to fall through a standard distance measured on a scale and the hardness number determined by the height to which the hammer rebounds.—Editor.]

Draft-Gear Bearing Area

To the Editor:

A member of the Committee on Couplers and Draft Gears calls attention to an article entitled "More Draft Gear Bearing Area Needed," appearing on page 397 of the September issue of the *Railway Mechanical Engineer*. In this article reference is made to the 1937 report of the Committee on Couplers and Draft Gears, A. A. R. Circular DV-917, in which it was recommended that bearing area of cast-steel vertical yoke be increased 67.5 per cent and to reduce the wedging effect on the bearing area by decreasing the taper of the contact surface.

Contrary to the author's statement that "I do not believe that this was accepted," this change in design was included in Letter Ballot Circular DV-924 dated August 20, 1937, page 77, Proposition 19, and was approved, as will be noted from result of Letter Ballot in Circular DV-927 dated October 27, 1937. These changes were incorporated in the Manual in 1939 and are now covered by pages C-38-A-1941 and C-38-B-1941.

In the second paragraph of the article mention is made of inspection by the author of a new yoke, removed from a car, bearing casting date 12-41, and reference is made to damage to the gear housing, also illustrated, as a result of using yokes of this design, which damage it is stated would not have occurred if the committee's proposed change in design of yoke had been made at that time.

V. R. Hawthorne,
Executive Vice-Chairman, Mechanical Division, A. A. R.

Erie Modernizes

Hornell Flue Repair Shop

Well-engineered plant speeds flue repairs—Electric eye control and other automatic devices used—One shop now does the work of two—New method of cleaning flues employed

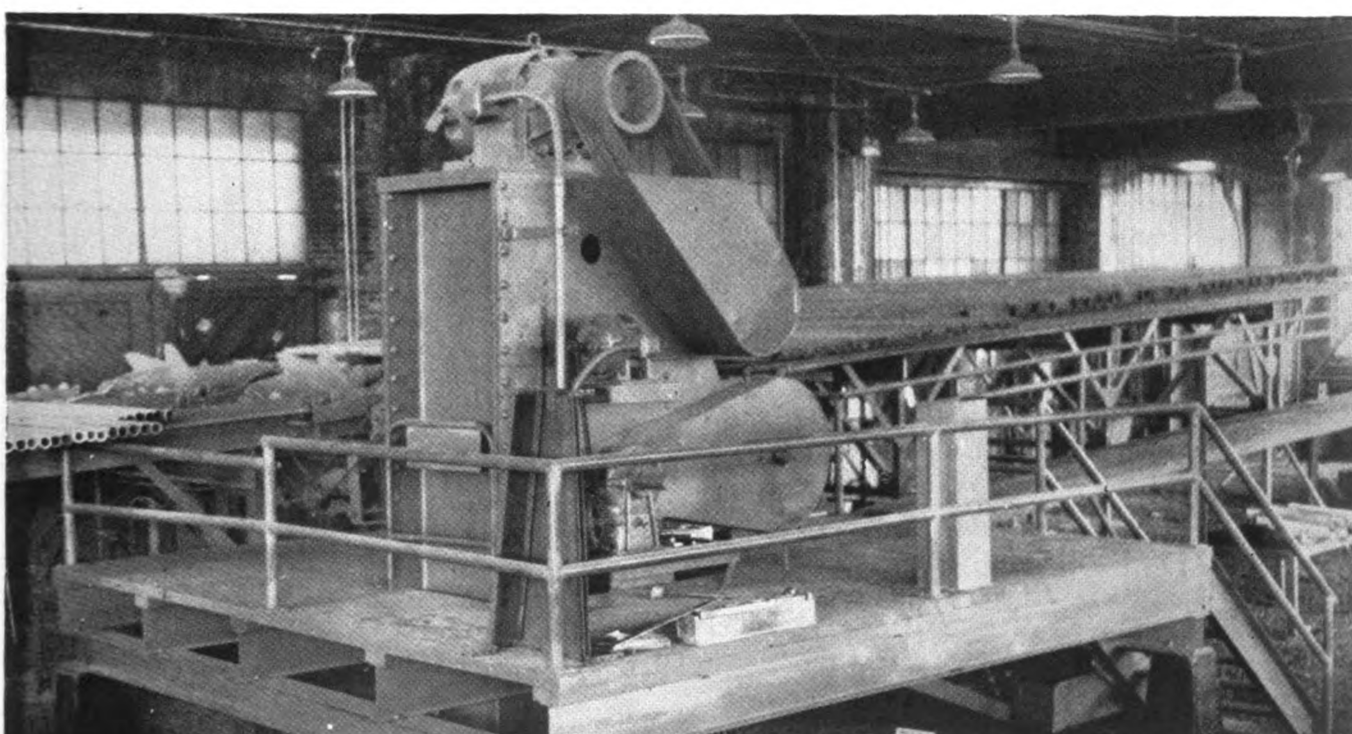
RECLAMATION of locomotive boiler flues on the Erie is now done for the entire railroad at the Hornell shops in a well-equipped, well-laid-out shop which has recently been placed in full operation. Normally the Erie removes, repairs and reapplies approximately 75,000 flues annually. They range, in outside diameter, from 2 in. to 5½ in. and, in length, from 11 ft. 6 in. to 24 ft. 0 in. Formerly it was necessary to have flue shops in operation at both Hornell, N. Y., and Meadville, Pa., to perform necessary flue repairs.

After studying flue-repair methods in a number of plants, Erie engineers devised the present set-up which incorporates new machinery and original methods which are not in use on any other railroad. Operation of the system is such that the manual handling of flues is eliminated and many of the operations are completely automatic. All machinery is housed in a building having a clear floor area 66 ft. in width and 148 ft. in length. This building is of brick and steel construction. It is located immediately adjacent to the locomotive erecting shop.

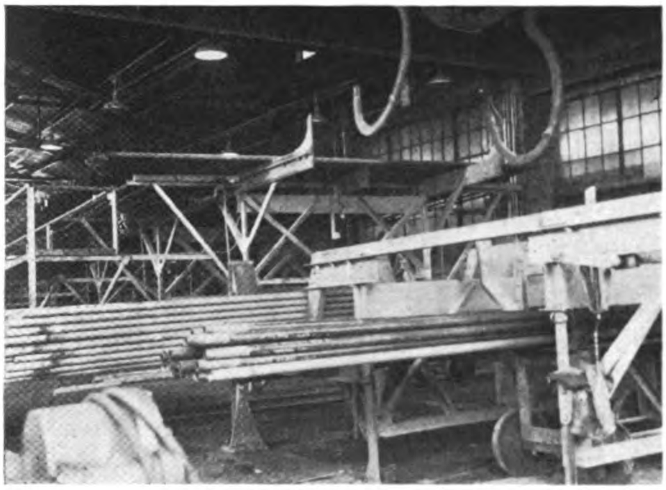
Sequence of Operations in the Flue Reclamation Plant of the Erie at Hornell, N. Y.

1—Cut off ragged end, the end removed from the firebox flue sheet.
2—Clean scale from outside of flue.
3—Inspect flue for pitting and other defects.
4—Weld on safe end.
5—Heat the safe end in an oil furnace to forging heat.
6—Swedge the flue end to the proper size to fit the firebox flue-sheet hole.
7—Cut the flue off to proper length measuring from the swedged end.
8—Anneal the cut end by heating to 1,600 deg. F. in an oil furnace. Cool in still air.
9—Form the annealed end. When the flue is first removed from the annealing furnace the hot end is placed in a pneumatic clamp die machine which forces a plunger inside the flue. This operation sizes and trues up this end of the flue to fit the front flue-sheet hole.

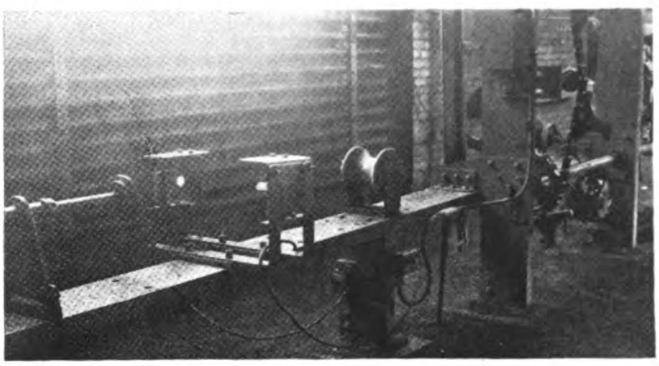
Flues removed from engines undergoing repairs are brought into the shop on buggies and lifted to the top of the "dirty flue" gravity conveyer rack by large hooks which are suspended from an overhead crane. This rack, constructed of three channel-and-angle runways spaced 5 ft. apart, is 84 ft. in length, has a slope of 0.7 in. per ft. of length. The first cutoff saw for removing ragged ends is located at one side of the center of the rack. The upper half of the rack is equipped with steam coils which serve to dry out any moisture in the scale on the outside of the flues. This drying process is necessary to prevent plugging up the cleaner to which the flues later pass. At the end of the drying section



The receiving rack and the first cut-off saw



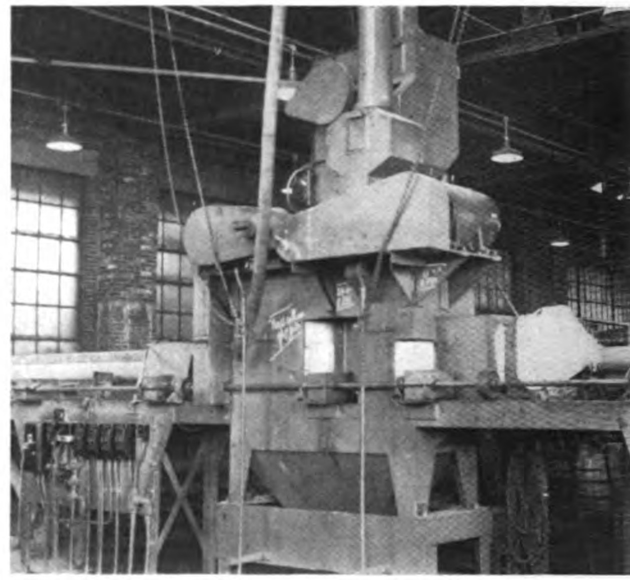
The large lifting hooks raise flues from shop buggies onto the first rack where they are dried before going through the cleaner. These hooks are also used to place finished flues, shown in the foreground, onto shop buggies for delivery to the erecting shop



Electric eye and other automatic controls are used throughout the newly designed shop

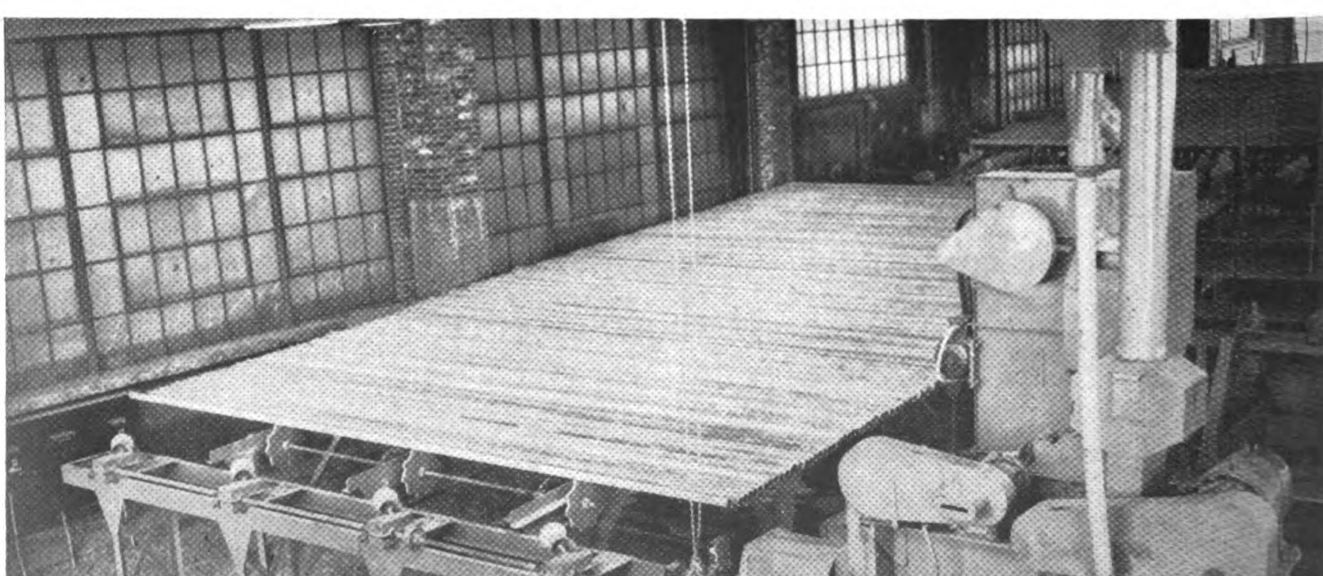
of the rack, above the cutoff saw, there is a feeding mechanism, operator controlled, which moves the flues into the saw.

After leaving the cutoff saw the flues roll down to another feeding mechanism which starts them through the flue cleaner. This feeder is controlled by an electric eye. As the end of a flue passes out of the beam of the eye in entering the cleaner the light beam is re-established and operates an electric contactor and air cylinder which revolves a cam feed one tenth of a revolution thereby feeding another flue onto constantly rotating conveyor rolls leading to the cleaner. These conveyer rolls are V-shaped and serve to move flues through the cleaner at speeds ranging from 8 ft. to 29 ft. per minute. The speed is manually controlled and is set according to the scale condition of the flues being cleaned. Angular setting of the conveyer rolls serves to rotate the flues passing through the cleaner and uniform scale removal is obtained.

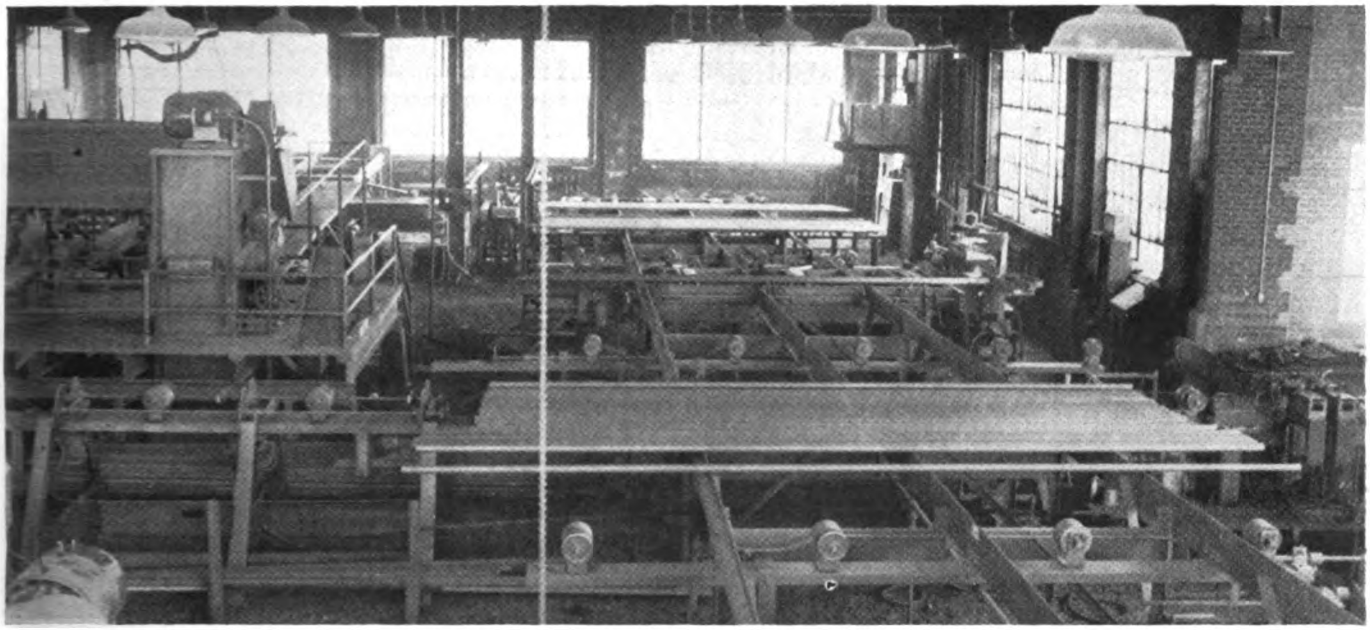


Flues pass through the cleaner at a rate of speed determined by the amount and condition of the scale to be removed

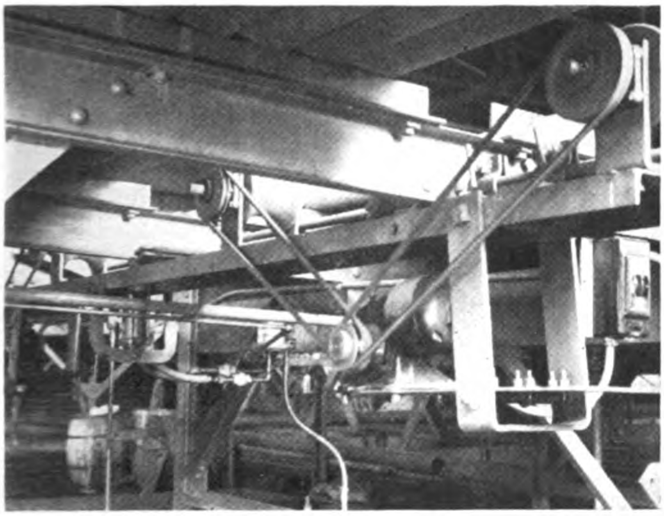
A Ryerson-American Wheelabrator Flue Cleaner developed by the American Foundry Equipment Company, Mishawaka, Ind., is used. It consists of a sheet-iron hous-



Dirty flue rack below the cut-off saw—The cleaner is also shown



After cleaning, the flues are raised automatically onto this rack which carries them through the remaining operations



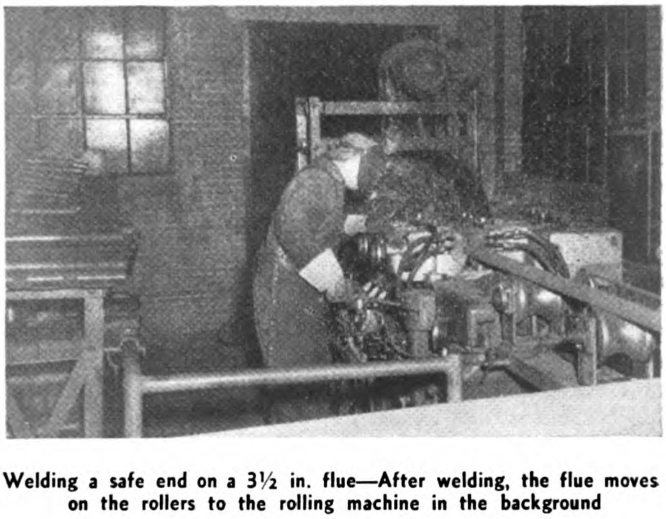
Many varied drive arrangements under the clean flue rack determine the speed with which flues are delivered to the welder

ing with a centrifugal wheel mounted directly over the path of the flue. The wheel is constructed of two discs which are so arranged that metal shot or grit fed into the center of the wheel will be thrown downward onto the flue by the action of centrifugal force. Scale is removed from the flues down to the bare metal and it is reduced to a fine dust which is drawn off by a suction fan through vertical pipe connections at the top of the cleaner. This dust is passed through a filter and drops into a chamber from which it is removed periodically.

As clean flues leave the cleaner they proceed along another series of conveyer rolls to a point where they interrupt the beam of another electric eye. When the beam is broken, machinery is set in operation which lifts the flue onto the "clean flue" rack which leads to an automatic welding machine. At this point it is possible to scrap flues which visual inspection have shown to be unfit for reclaiming. As flues emerge from the cleaner an operator determines whether excessive pitting is evident. If there is such pitting he switches off the electric eye which controls the lifter and the flues continue along another conveyer through an opening in the wall of the building to the scrap flue pile outdoors.

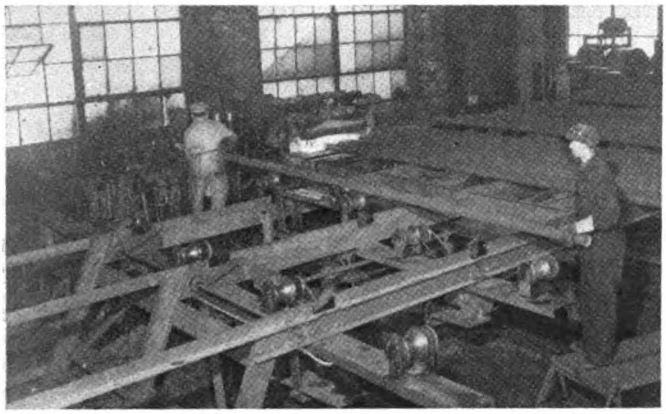
The "clean flue" rack, which slopes 0.35 in. per ft., is 113 ft. in length and slopes in a direction opposite to that of the "dirty flue" rack. As the flues move along the "clean flue" rack they reach a 6-in. electric butt-welding machine where safe ends are applied. After the welded joint has been rolled, the flue enters upon a set of three horizontal spiral screws which carry it through an end-heating furnace. The speed of operation of these screws can be controlled between 0.8 and 5.0 revolutions per minute and the speed of the spiral is set according to the size of the flues being worked. Four flue ends are in the furnace at a time and they are raised to the proper-temperature for the swedging operation. After swedging, the flues roll by gravity to another cutoff saw where they are cut to the proper length for re-application to locomotives.

Leaving the cutoff saw, the flues move over another set of spiral screws which carry them through an annealing furnace at the rate of speed required for flues of various sizes. Another series of conveyer rolls then carries the completed flues to a delivery rack. Here again an electric eye is employed to make this operation



Welding a safe end on a 3½ in. flue—After welding, the flue moves on the rollers to the rolling machine in the background

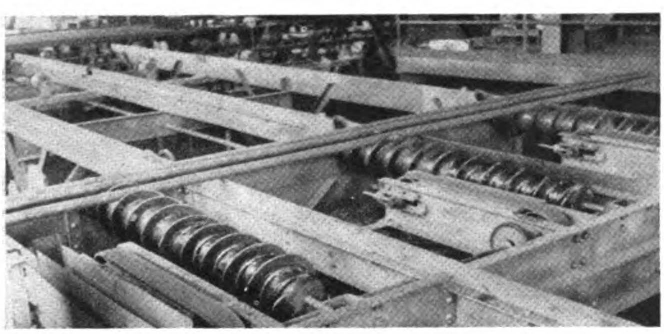
automatic. As the beam is broken by flues moving along the conveyer rolls they are passed onto a chain elevator which raises them to a delivery rack from which they



Flues move through the heating furnace at speeds determined to deliver them at the proper temperature for swedging

are loaded on the shop buggies employed to carry sets of flues to locomotives on the erecting floor.

Nineteen electric motors of ½-hp. each are required to operate the various conveyer rolls. The "dirty flue" cutoff saw was designed and built by the Erie and has



Spiral screw feeder at the swedging furnace

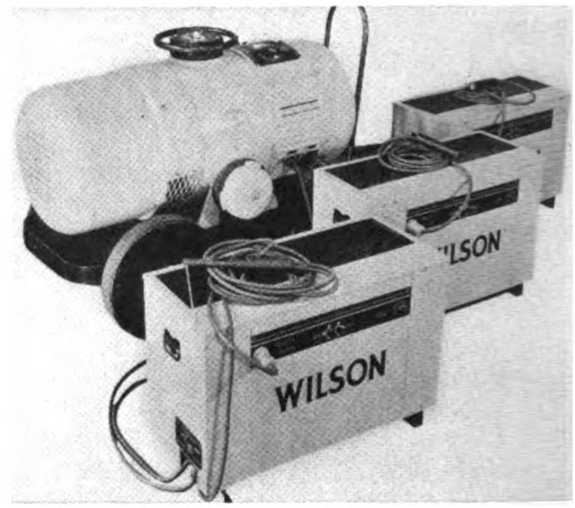
a capacity for making 400 cuts per hour on any size flues. The saw blade, 42 in. in diameter, is driven by a 40-hp. motor.

The design and installation of these new facilities was carried out by C. F. McKinney, supervisor of tools and machinery, and members of his staff.

Control Stations on Arc-Welding Generators

Auxiliary electric stations to be connected in series with the welding circuit of any constant-potential arc-welding generator are said to increase the practical effectiveness of the machine by permitting two or more operators to work independently from the same generator. Made in 75-amp, and 150-amp, capacities, these units when attached to the machine can be operated simultaneously and each operator can weld as he sees fit, regulating his current without affecting the other operator or operators. Current can be regulated without breaking the arc through the use of a switch control. This allows an operator to start on cold work with a "hot" arc and gradually reduce the current as the work warms during welding. Or the control can be set to deliver a constant current at the arc.

Using two 75-amp. control stations, a 200-amp. gen-

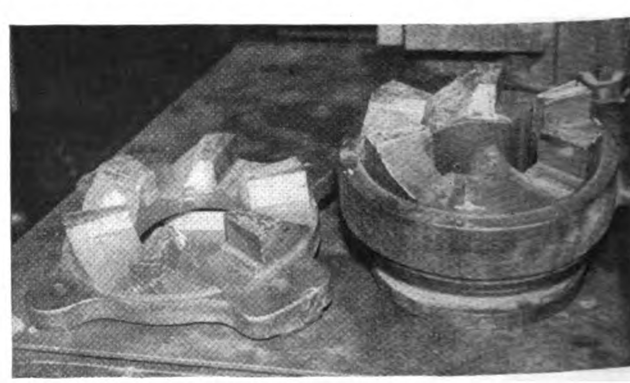


Separate switch-controlled stations increase the practical effectiveness of constant potential arc-welding generators

erator can serve two operators. A higher efficiency and a better load factor result because the generator is operated at near its rated capacity at all times. A 400-amp. generator can serve five or six 75-amp. stations, or three of four 150-amp. stations. Each operator can draw precisely the amount of current which he needs up to the capacity of his station. Known as the "Honey Bee" these arc-control stations are manufactured by the Wilson Welder and Metals Co., New York.

Welding Saves Time In Punch Press Repair

The reclamation of car and locomotive parts by welding has had a wide range of application in railroad shops. Also important is the value of welding in keeping shop



The teeth on this power-drive clutch for a duplicator punch press were restored by welding, machining and flame hardening

machinery operating. The illustration shows a clutch power drive for a duplicating punch press used in the fabrication of car parts at a major car-repair shop on which badly worn teeth were built up, machined and flame hardened in a much shorter time than would

have been required to make or otherwise obtain new parts.

In this case the teeth were built up by the oxyacetylene process using plain carbon-steel welding rods. Application was made without preheating of the entire piece. After sufficient weld metal has been applied the clutch parts were taken to the machine shop and tooth contour was restored on a milling machine. When the machining operation was completed the teeth were flame hardened and the parts were ready to be restored to service.

Long and expensive delays caused by breakdowns in machinery parts may often be avoided by such reclamation by welding as was employed in this instance on a machine part which is subjected to severe service stresses.

Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Repairing Holes In Passenger Truck Side Frames

Q.—We have made it a practice to build up the brake rod hanger pin holes and the spring equalizer bolt holes when these parts wear through the bushings. This is a tedious job and not too satisfactory. Can you suggest a better method of repairing these holes?

A.—Perhaps the best and quickest method of repairing the worn holes on passenger car trucks is to round out the hole with the cutting torch. The new bushings are made to fit the flame cut hole as near as possible. After the bushing is driven into place with a hand hammer it is welded securely with the electric arc using a heavily coated rod.

Welding Cracked Spring Saddles

Q.—Is it permissible to weld cracked spring saddles?

A. Cracked spring saddles may be welded. Cracks usually occur near the top on the side of the saddle. The most common method used is to cut out these cracks with the cutting torch and fill the resulting vee, using heavy coated electrodes. All spring saddles that have been welded should be annealed.

Building Up "Snow" Pulleys

Q.—During the winter months we use a sectional pulley for driving passenger-car generators. This pulley is made of ¼-in. plates spaced about 1½ in. apart so as to break up the snow and ice that accumulates on the belt. These plates wear rapidly. We have tried building up the edges by both arc and oxyacetylene methods but it is a long and tiresome job. Do you know of an easier way to rebuild these pulleys?

A—A welder on a northern railroad solved this problem by using additional pieces of plate. The pulley is turned down until the plates upon which the belt runs are of equal diameter. The amount of plate needed to build the pulley back to its original size is measured and strips of steel the proper width and length are cut. Usually, this takes pieces ¼ in. by ¾ in., (the length varies with the width of the pulley). The pulley is set up on the bench and the strips tacked in place until each section has a new piece tacked to it. The new pieces are then welded all around using down-hand coated rod. The pulley is then sent to the lathe and the crown machined on the added material.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Welding on Boiler Shells

Q.—When applying pipe clamps or other construction to the shell of a boiler by welding, in place of studs, would the efficiency of the shell be affected? If so, what provision should be made in determining the working pressure of the boiler, making the proper allowance for these welds?—F. M. J.

A.—Welding on the shell course of a locomotive boiler is not considered good practice and is generally prohibited for the reason that the internal stress set up in the plate due to the welding cannot be readily stress relieved.

The A.S.M.E. Code for Power Boilers, Par. P-186 (d), makes provision for determining the strength of the shell, when non-pressure parts are tack welded to it as follows: "Non-pressure parts may be tack welded to the shell or drum of a boiler, provided the strength of the shell or drum is computed with such welds considered as the equivalent of holes drilled through the shell of the following diameters:

(1) "For material containing more than 0.35 per cent carbon, such as that used in forged seamless steel drums, the diameter of the equivalent holes shall be taken as twice the maximum dimension of the weld, but in no case shall a weld exceed 1 in. in length.

(2) "For the material containing not to exceed 0.35 per cent carbon the diameter of the equivalent holes shall be taken as the maximum dimension of the weld plus ½ in., but in no case shall a weld exceed 3 in. in length.

(3) "The efficiency of the ligaments between any two of the welds (considered on the basis of equivalent holes) shall not be less than the required efficiency for ligaments or longitudinal joint of the drum.

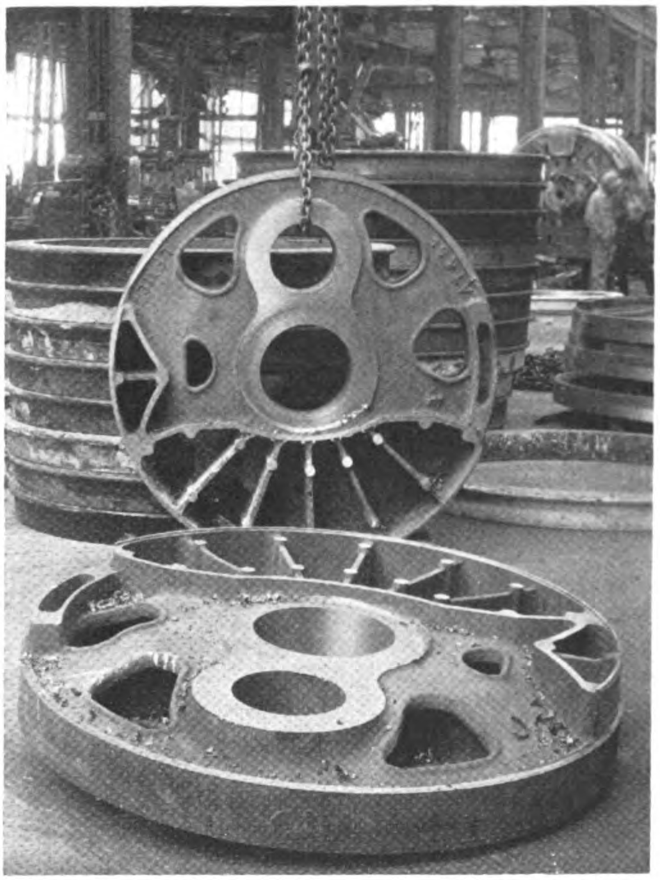
"When non-pressure parts are attached by fusion welding to pressure parts of carbon steel containing not more than 0.35 per cent carbon, or of molybdenum steel containing not more than 0.20 per cent carbon, no deductions need be made on account of welds having a throat thickness not exceeding ¼ in., if the welds are not over 3 in. in length and have a center-to-center distance not less than twice this length. This rule also applies to continuous welds longer than 3 in., if the weld metal is deposited intermittently in sections not over 3 in. long, with center-to-center distances not less than twice this

length, and if these welds are peened and the intervening space then welded and peened.

"When non-pressure parts are attached by fusion welding and the drums are subsequently heat treated or stress relieved in accordance with Par. P-108, no deductions need be made on account of the welds."

Counterbalancing Driving Wheels

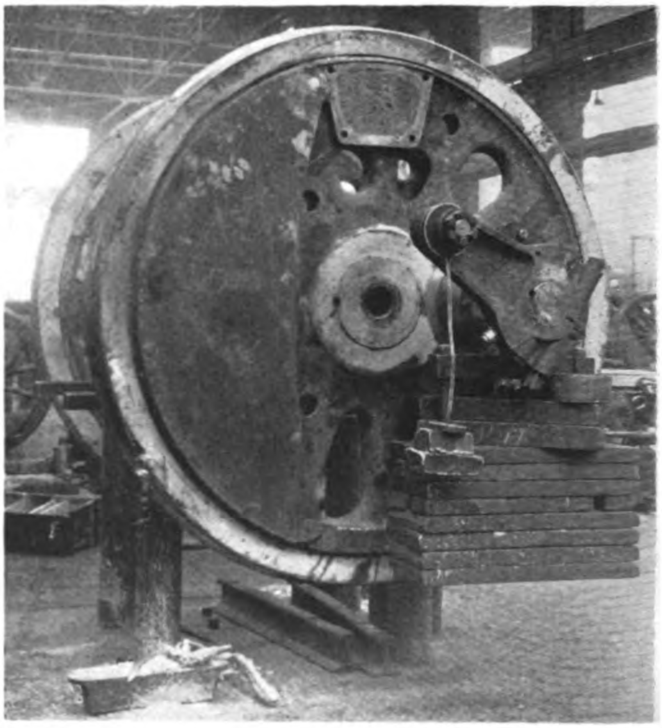
With present high operating speeds, the methods used in counterbalancing driving wheels assume increasing importance. The illustrations which accompany this



A pair of main driving-wheel centers

article show how this operation is performed at the Albuquerque, N. M., shops of the Atchison, Topeka & Santa Fe. In order to secure maximum accuracy, the wheels are balanced so as to take into account not only the weight of the driving rods and unbalanced reciprocating weights, but the eccentric cranks are mounted in place and weights suspended from the pins, equivalent to the back end of each eccentric rod.

In cross-counterbalancing the main driving wheels, to compensate for the fact that the revolving weights are not all in the same plane, a pocket is cast in the wheel center at right angles, or 90 deg. from the main pin position, this pocket being filled with the required amount of lead in accordance with the degree of cross-counterbalance desired. The use of this pocket has the effect of shifting the center of gravity of the combined counter-

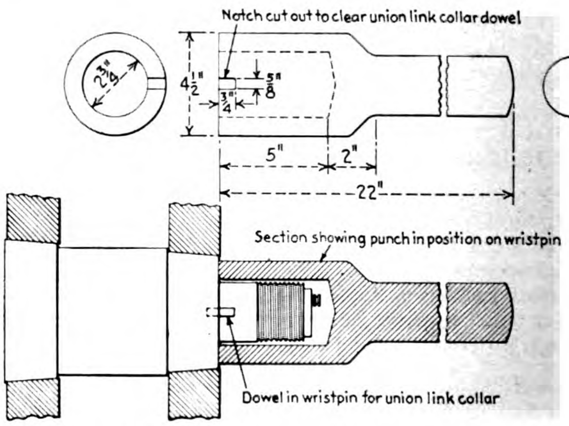


The weight of the back end of the eccentric rod is taken into account in counterbalancing main driving wheels at the Albuquerque shops of the Santa Fe

balance weight the few degrees necessary, without the complication involved in actually moving the angular position of the main counterbalance.

Punch for Removing Crosshead Wrist Pins

The accompanying drawing shows a punch which has been developed in the locomotive shop of a Canadian railroad, the use of which makes it possible to knock out locomotive crosshead wrist pins without the necessity of striking the pin on the threaded end with the possible danger of damaged threads or grease fittings. An additional advantage of this particular type of punch is that it applies the force of the blow at the end of the tapered section.



This punch applies the blow at the tapered section of a crosshead wrist pin

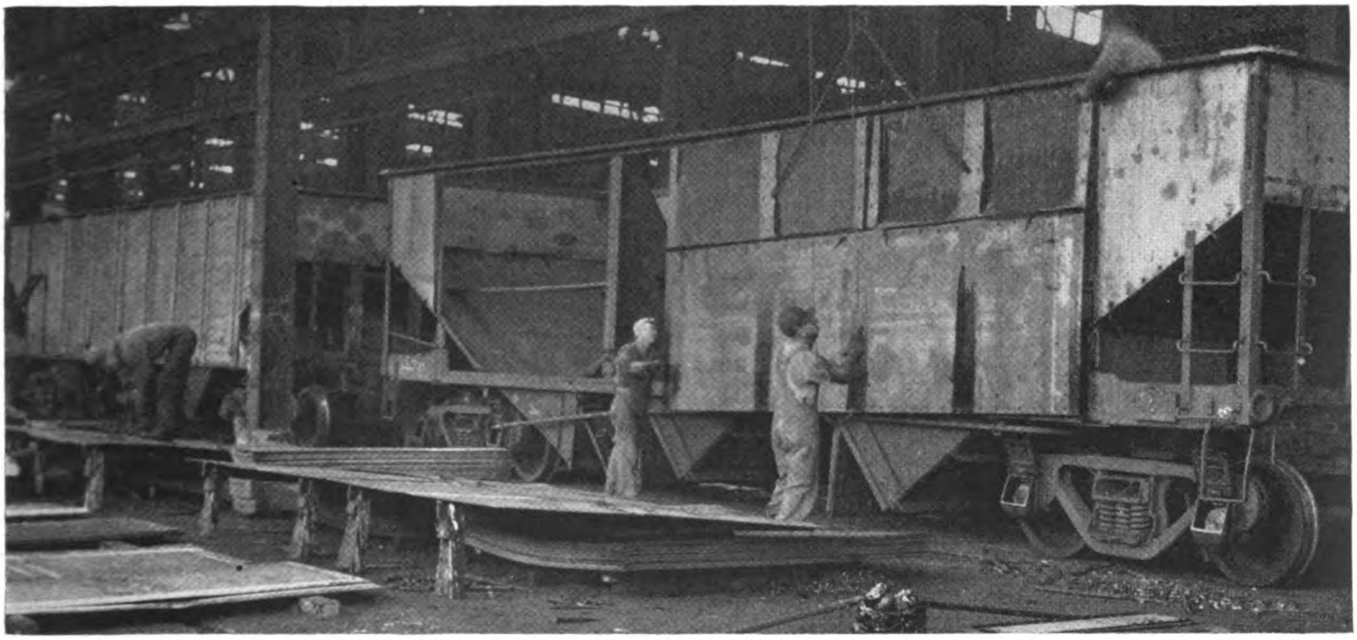
Hopper Cars Repaired with New and Old Materials

Keeping hopper cars repaired and in service when side systems required renewal and no steel was available of sufficient width to meet the original structural design was a problem which faced the mechanical department officers of one railroad in its effort to continue a 70-ton hopper car repair program. A survey of the railroad's steel supply disclosed that a quantity of sheet steel was on hand which was intended for the re-flooring of a series of mill-type, steel-floor gondola cars. Work on this series of cars had not been begun and it was decided to utilize this steel in order to continue the side replacement program on hopper cars. The flooring steel was not of sufficient width to extend from the side sill to the top angle of the hopper cars and this made it necessary to redesign the side structure to make possible the use of the steel.

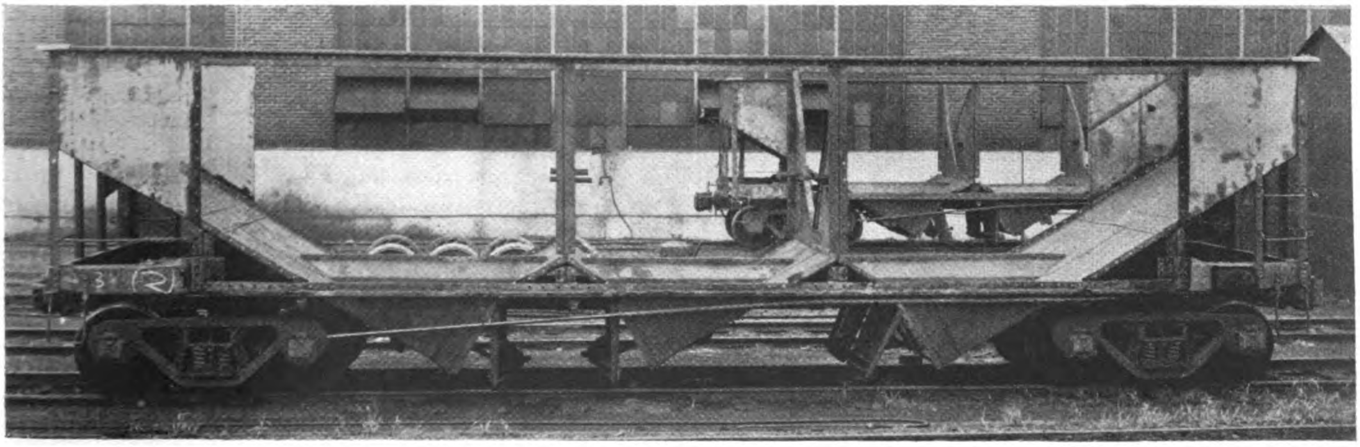
Steel from the top sections of the sides removed, in the area of least corrosion, were sheared to provide a sheet of a width great enough to join to the gondola floor sheets and, by the use of a longitudinal butt strap, give a sheet of the desired width. The new steel was used along the side sill, the area of greatest corrosion, while the older steel was returned to its place at the top of the side section. Each car side required two sections which were assembled on jigs on the shop floor and then applied to the car.

A progressive system of repair was used for the completion of twenty cars each working day. Cars were stripped inside the shop where side, corner and end sheets, side and end bulb angles, and K-2 type air brakes were removed. Passing from the stripping location the cars progressed through construction operations until the bulb angles, corner caps, end sheets, side corner sheets and AB brake equipment brackets had been applied. When this work was completed the cars were drawn by a tractor and cable arrangement onto a transfer table and moved to an adjoining track for the balance of the shop operation. One of the photographs shows a car at this stage of the work.

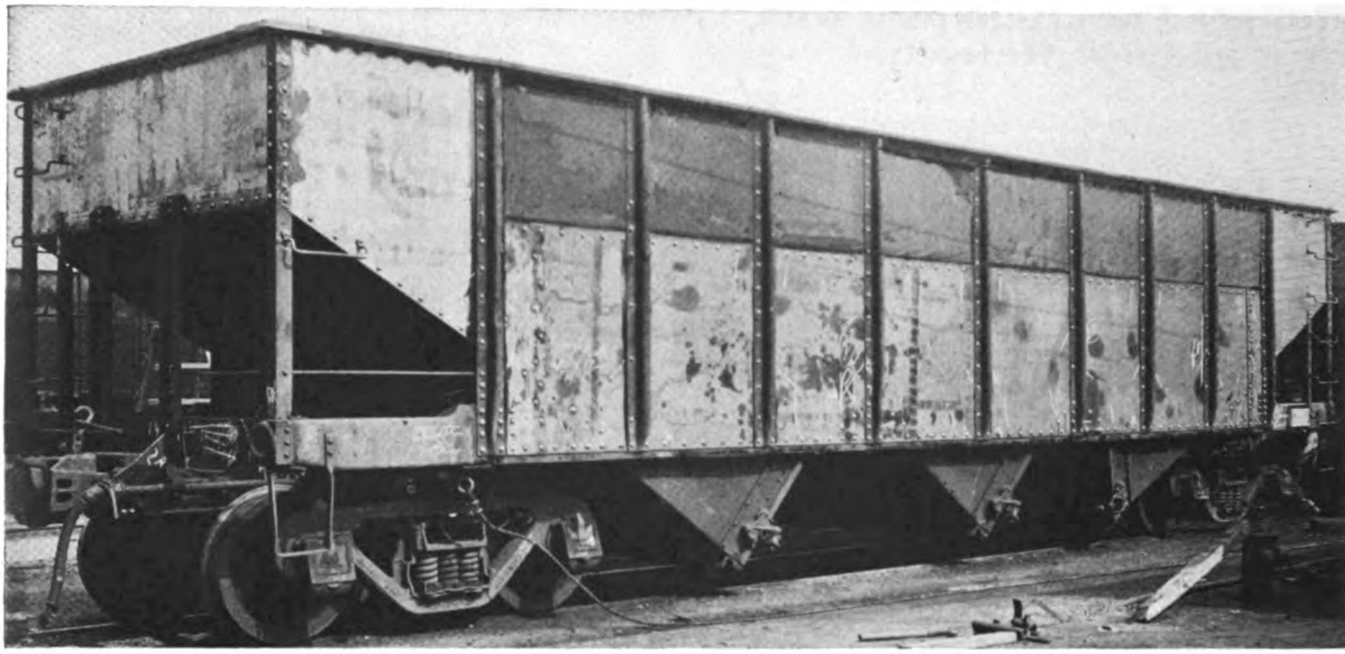
The first operation on the second track was the application of the cylinders, valves and reservoirs for the AB brakes. In this same location the trucks were completely overhauled. Moved forward by cable and winch, the cars, worked in pairs, advanced to the spot in which the composite sides were applied. Brake piping and connections were also applied in this working location. After the next movement of the cars side stakes and



Applying a side section built of new and old materials to a hopper car—The jigs for the preparation of the sides are also shown



Hopper car ready for the application of new side sections



Completed car before painting—The neat appearance and structural strength of the composite side is evident

inside stake plates were placed in position and fitted up for reaming. The next two working spots were for reaming and riveting operations. In the final inside shop position, work on the brake system was completed while the draft gears were checked and repaired when necessary. After a final inspection the cars left the shop and went onto the paint track where they were cleaned, two coats of paint applied and the stencilling completed except for car weights. After weighing the stencilled weights were put on the cars and they were released to service.

Air Brake Questions and Answers

HSC High-Speed Passenger Brake Equipment

129—*Q.—What prevents back flow from the auxiliary reservoir?* A.—Check valve *73* permits charging (brake pipe to auxiliary reservoir) but is seated by a spring *89* to prevent back flow from the auxiliary reservoir when that pressure in passage *5g* is higher than brake pipe pressure in passage *5f*.

130—*Q.—What is the position of the release piston during the charging operation and what serves to place it in such a position?* A.—Release position. The service slide valve chamber *C* and the release side valve chamber *D* are connected by passage *5g* so that auxiliary reservoir pressure is the same in both chambers at all times. Auxiliary reservoir pressure in chamber *C* is also connected to the spring side of release piston (chamber *K*) through port ***a*** in service slide valve and passage *a-1*. With air pressure acting on release piston balanced, spring *116* moves the piston and attached slide valve *112* to release position.

131—*Q.—What communications are opened by reason of this position of the release piston and slide valve?* A.—Cavity *Q* in the slide valve connects displacement reservoir passage *3b* to exhaust passage *10*.

132—*Q.—Is the emergency reservoir charged at this time?* A.—Yes, simultaneously with the auxiliary reservoir, from the release slide valve chamber, through passage *2c* (at the right end of the release slide valve), passage *2f*, past ball check valve *195* and flat check valve *73c*, passages *2k* and *2a* and pipe *2* to the emergency reservoir.

133—*Q.—How long does communication exist between the auxiliary and emergency reservoirs?* A.—As long as the auxiliary reservoir pressure is higher than the emergency reservoir pressure, spring *89c* is overcome and check valves *195* and *73c* are unseated, permitting this charging flow, but when the emergency reservoir pressure is higher, the check valves are seated. This action prevents back flow from the emergency to the auxiliary reservoir.

134—*Q.—Describe the initial flow of brake pipe air in the emergency portion.* A.—Brake pipe air in chamber *B* on the face of emergency piston flows through charging choke *27* to chamber *E* on the slide valve side of the piston and through passage *4* to the quick action chamber.

135—*Q.—Are the supply reservoirs charged at this time?* A.—Yes, simultaneously with emergency and auxiliary reservoirs to existing brake pipe pressure.

136—*Q.—From what sources are the supply reservoirs charged?* A.—From auxiliary reservoir through the release slide valve chamber *D*, port ***r*** in the release slide valve, passage ***r1*** in the seat, past ball check valve *74* and flat check valve *87* to passage *6* and the supply reservoirs. Spring *84* is overcome and check valves ***74*** and *87* are unseated, permitting this charging flow as long as auxiliary reservoir pressure is higher than supply reservoir pressure, but when supply reservoir pressure is higher, it seats the check valves and prevents back flow from the supply to the auxiliary reservoir. From brake pipe air in chamber *A* on the face of the service piston, through passages *1c* and *1d* cavity in the limiting valve slide valve *136*, passages *1k* and *1f*, past ball check valve *74a* and flat check valve *73a* to the chamber above flat check valve *87*, where the flow combines with the charging flow from the auxiliary reservoir through passage *r1*, thence to the supply reservoirs through passage *6*, spring *89a* is overcome and check valves *74a* and *73a* are unseated, permitting this charg-

ing flow as long as brake pipe pressure exceeds supply reservoir pressure, but when supply reservoir pressure is higher, it seats the check valves and prevents back flow from the supply reservoirs to the brake pipe.

137—*Q.—Is the supply for brake applications always available under the electro-pneumatic operation?* A.—Yes. The brake valve on the power unit maintains charging connections for all HSC brake application handle positions so that the reservoirs are continually charged in this manner.

138—*Q.—At this stage what is the status of the application and release magnets of the 21-B magnets on each locomotive and car unit?* A.—With the application and release circuits open at the master controller on the locomotive unit, the application and release magnets are de-energized. (Refer to Fig. 18.)

139—*Q.—What is the position of the application and release magnet valves at this time?* A.—Auxiliary air unseats by-pass valve *5* and flows to passage *6a*, charging the chamber beneath application magnet valve *34*, which is held seated by air pressure and its spring *35a*. Release magnet valve *62* is unseated by spring *35*, thus connecting passages *4a* and *x*, opening the straight air pipe to the exhaust.

High-Speed Freight-Car Trucks

By James A. Shafer*

The earliest designs of cast-steel freight-car trucks had separate journal boxes attached in various ways. The next step was to cast the journal boxes integral, and for the last ten years there have been several designs manufactured that eliminate the spring plank.

Other than refinements in design, such as the change from T-section to U-section side frames and other improvements that increase the factor of safety, there has not been much change from the first integral-journal-box side frames. The trend in recent years has been away from the pressed-steel bolster and to the cast-steel bolster.

The spring suspension adopted by the A. A. R. in 1915 was used in freight-car trucks until about 1933 when a new spring was designed primarily to reduce spring failures. This 1933 spring had greater capacity and less deflection than the 1915 spring but did not ride as well.

About the time that the spring-plankless trucks were introduced an effort was made to improve the riding qualities of freight cars and the snubber or stabilizer appeared on the market. To test these various devices the A. A. R. ran a series of tests in 1933 at speeds up to about 60 m.p.h. These tests showed that trucks equipped with plain coil springs would bounce or oscillate vertically when the natural period of the springs was in resonance with the shocks caused by the rail joints.

Performance of 1915 A.A.R. Spring

It was found that the 1915 springs rode smoothly up to about 40 m.p.h. with a light load and to about 36 m.p.h. with a heavy load. The 1933 springs had corresponding speeds of about 43 m.p.h. and 38 m.p.h. As the speed was increased the vertical oscillations became violent and at the worst point the critical speeds were discovered to be about as shown in the table.

Approximate Critical Speeds of Freight-Car Springs in Miles an Hour

	1915 spring	1933 spring
Light load	47	52
Heavy load	41	47

An increase in the load reduced the speed at which oscillations occurred and also reduced the intensity of the shocks. The tests indicated that an increase in speed above the critical points tended to reduce the shocks, but near 60 m.p.h. which was the top speed reached on these tests, the shocks began to increase in intensity again.

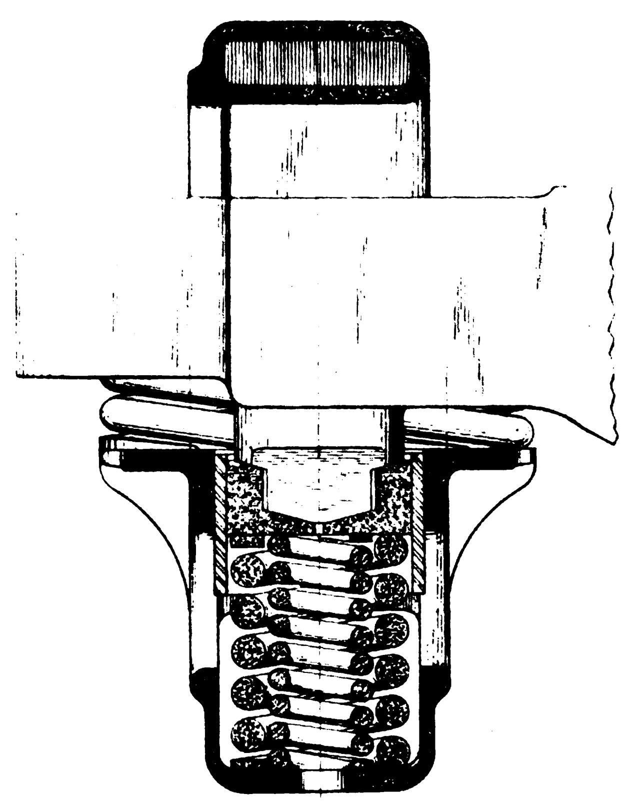
A comparison was also made between concentric and eccentric wheels. It was found that the eccentric wheels caused severe spring oscillation at speeds between 25 and 30 m.p.h. whereas true wheels did not. On the other hand, the eccentric wheels produced less disturbance at the higher speeds where the oscillations were caused by the rail joints.

All of the stabilizing devices tested improved the ride and some of them removed over 90 percent of the bad riding qualities of the plain spring group. Since the above tests were run the 1936 A. A. R. spring has been adopted. It has less capacity and more deflection than the 1933 spring.

1939 A.A.R. Spring Tests

Because freight train speeds have been constantly increasing and because the 1933 tests reached a maximum speed of about 60 m.p.h., the A.A.R. ran a test in 1939 to investigate the riding qualities and safety of freight-car trucks at speeds up to 85 m.p.h.

These tests also showed that plain coil springs ride badly when their natural period of oscillation is in

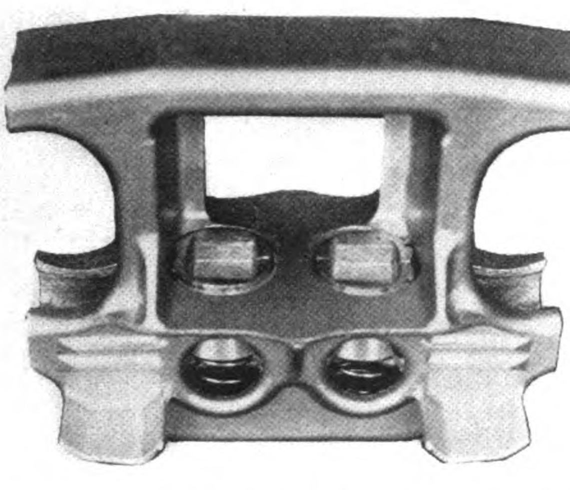


A section through the dual control units

* Specialty Development Engineer, National Malleable and Steel Castings Co., Cleveland, Ohio. This paper was read before the Eastern Car Foremen's Association in New York on Nov. 13, 1942.

resonance with the shocks produced by the rail joints or out-of-round wheels. Since the natural period of oscillation of coil springs is determined by the deflection, it follows that the critical speed for any car is determined by the load the car is carrying.

The critical speed for average freight cars so far as wheel action is concerned, was found to be about 25 m.p.h. and rather narrow in range, sometimes only about 2 m.p.h. wide. The resonance from rail joints occurred at speeds from 40 to 50 m.p.h., but the range was found to be as much as 10 m.p.h. wide. Because of this the effect of rail joints was felt at speeds from 35 to 55 m.p.h.



Looking from the inside of a side frame at the dual control units in position

The latter cause for bad riding is much more serious from an operating standpoint because of the speed at which it occurs and the relatively wide range.

It had been thought that there might be other critical speeds when the unexplored range above 60 m.p.h. was reached, but the observers could not detect any period of resonance above 60 m.p.h. They found the shocks at these higher speeds were due to individual low spots in the track. In the speed range above 60 m.p.h. the shocks seemed to increase in intensity with an increase in speed but the indications were that the maximum shocks had been recorded before reaching 85 m.p.h.

Controlling Oscillation, Safety at High Speeds

This oscillation of plain coil springs can be reduced and controlled to some extent by friction springs or other devices and all of the trucks tested had some sort of an energy absorption device except the A.A.R. trucks. There is some minimum energy absorption rate that is required to take care of these spring oscillations but too much absorption may make the spring suspension so stiff that it will do more harm than good. It was indicated that 20 per cent was about correct.

The 1939 test report states that practically all of the trucks would have been satisfactory if the tests had been confined to the mainline only or if the speeds had not exceeded 60 m.p.h. Therefore, the problem is to get the required riding qualities and safety on branch-line track at speeds in excess of 60 m.p.h. However, it is our understanding that the branch over which this test was run is probably the equal of much main-line track.

When speeds above 60 m.p.h. were reached it was discovered that in addition to bad riding some trucks had a tendency to oscillate horizontally or "see-saw." This might be described as an unsquaring action where one frame would alternately run ahead of and then behind the other. It was this action that caused some of the trucks to be considered unsafe for high-speed service. As a matter of fact safety at high speed is more important than the riding qualities.

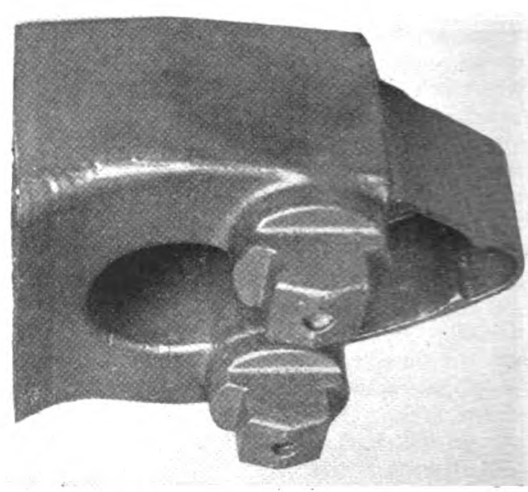
The ideal motion for a freight-car body to have would be one in which it moved along the track without change in vertical position. With irregularities existing in the track it is necessary for the springs to change deflection to accommodate them, and to get this ideal freight-car motion it would be necessary to have springs which could change their deflection without changing their capacity or force.

Since this is an impossibility the best that can be done is to design springs which have a force change as small as possible per unit of deflection. In other words, long-travel soft springs or springs with a low capacity per unit of deflection are essential in high-speed service.

It would seem that it should be comparatively easy to design a high-speed freight-car truck. For safety there should be some control to prevent see-sawing; for riding qualities an absorption device to control spring oscillations in conjunction with long-travel soft springs. However, it is impossible to secure the necessary softness of springs because of limitations in coupler height and the great variation in weight between an empty and loaded freight car. This puts a limitation on the riding qualities of freight-car trucks.

Limiting Factors in Design

The A.A.R. coupler-height range is between 34½ in. and 31½ in. above the rail. Because of wear and the settling of the car, the maximum spring deflection it is practical to use in freight-car trucks, is about 2½ in. This compares with 10 in. or more that is considered necessary to give a satisfactory ride in passenger cars.



Bottom view of the end of the bolster which shows the beveled nose design of the trunnions—These force friction wedges outward against split bushings

Passenger-car trucks can get the necessary deflection because the load they carry is such a small proportion of the weight of the car. The load freight cars carry is several times the weight of the car and this prevents getting the desired deflection and staying within the required coupler heights.

The damage resulting from spring oscillation depends

on two things: the amount of the oscillation and the frequency of oscillation. The amount of oscillation can be controlled by some form of friction but the frequency depends only on the deflection or softness of the springs and the frequency varies inversely as the square root of the deflection.

Passenger-car truck springs with 10 in. deflection oscillate once per sec.; ordinary freight truck springs with ¾ in. deflection oscillate three and one-half times per sec.; high-speed freight truck springs with 2½ in. deflection oscillate two times per sec. A high-frequency spring produces a bad ride for two reasons: because it produces more oscillations per mile, and because each oscillation is more damaging than a low frequency oscillation.

A rather rough estimate of what might be expected from high-speed freight-car trucks would be that they should ride from three to four times better than ordinary freight-car trucks and four to five times worse than passenger-car trucks. All of these trucks should be assumed to have some means for controlling oscillations.

Design Features of Dual-Control Truck

The National Malleable and Steel Castings Company manufacture a high-speed freight-car truck. It is called the National B-1 truck with Dual Control and was one of the twelve trucks tested by the A.A.R. in the 1939 test and one of the seven that went through the complete test program. We have proceeded on the theory that a high-speed truck should retain the simplicity of the ordinary freight-car truck and have surpassed this simplicity because no spring planks or spring plates are required. Our high-speed truck in the 5½-in. by 10-in. size weighs 7,008 lb., when using one-wear rolled-steel wheels, and this is believed to be as light as any freight-car truck on the market.

We believe the first requisite of a high-speed freight-car truck should be safety and the second, riding qualities. The car must stay on the track of course, and while careful consideration should be given riding qualities, the coupler-height restrictions and the loads carried limit the results that can be obtained.

To change wheels with the National truck it is only necessary to raise the bolster, remove the brasses and wedges and tip the brake hangers out of the hanger brackets. The frames can then be spread and the wheels rolled out.

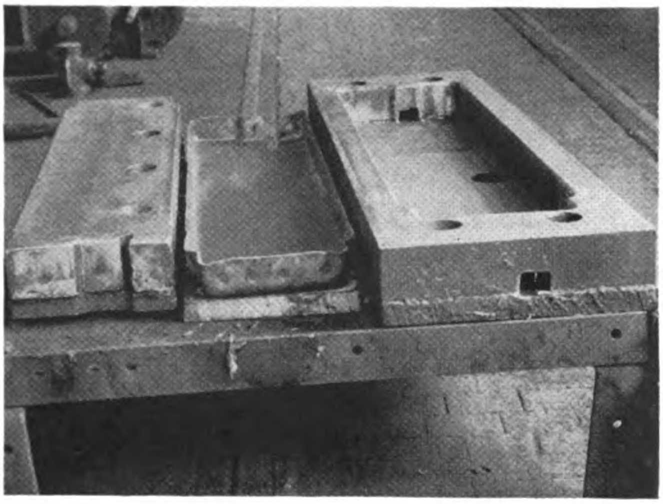
One of the illustrations shows a cross-section through the friction units, of which there are two per frame. The large trunnions cast on the bolster tie the frames together on the center line of the journals and eliminate the spring plank. It is not necessary to use spring plates to hold the springs in position, and the springs are protected from being driven solid.

The friction units consist of a split bushing, pressed into the frame and welded, and two wedges which seat on top of the springs. The wedges are forced against the bushings by the beveled nose on the bolster trunnions and the resulting friction controls the spring oscillations. The friction units have large bearing areas and also act as bushings to prevent frame and bolster wear.

The friction units not only control the spring oscillations which is necessary for good riding, but they resist unsquaring forces and make the truck safe for high speed operation, hence the use of the term "dual control." The entire weight of the car and lading tends to slide down the incline on the wedges and seek the center and the bottom of the wedge pocket. It is impossible to get the truck out of square without sliding the bolster trunnion up the wedge incline and raising the car.

Steel Dies From Scrap Locomotive Axles

Steel dies for the manufacture of many car parts are made from scrapped locomotive axles at an eastern railroad shop. Illustrated are dies for the manufacture of crossbearers used in the repair of high-side gondola cars. In making the dies a scrap locomotive axle was forged down to approximately the desired



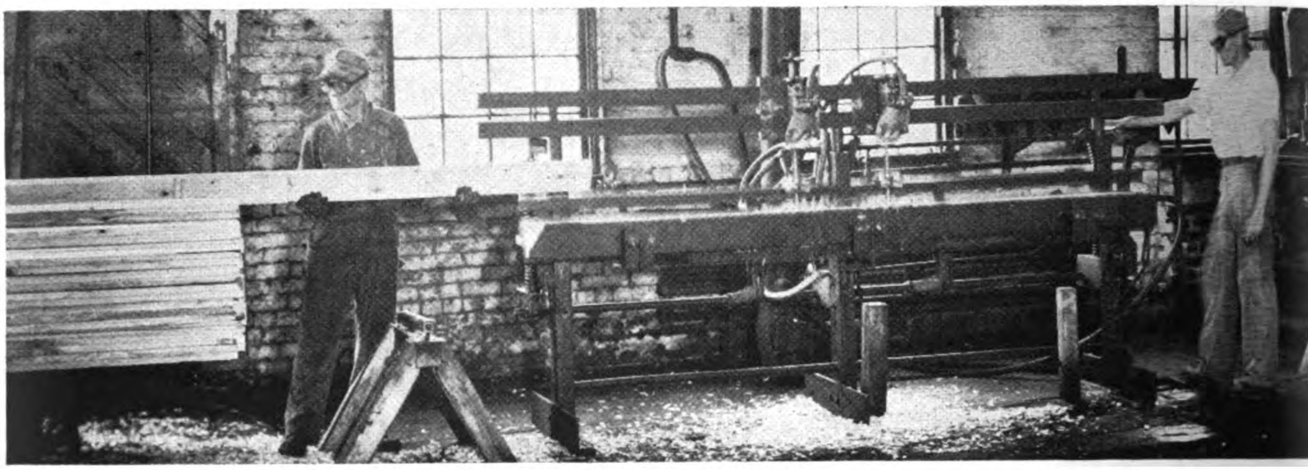
Steel dies for fabrication of crossbearers for a gondola car

dimensions and then the work was transferred to a planer for reduction to exact size. A template was made for use on an oxyacetylene gas cutting machine and, using it as a guide, a cut was made completely through the thickness of the metal. The kerf resulting from the flame cutting operation provided most of the necessary clearance between die faces. The final machining operations were completed on a shaper after which a backing plate was applied by welding to the female die. The dies were then drilled for application to the face plates of a bulldozer on which the crossbearers are made. Corners and other wearing surfaces of the dies are built up with a tool-steel welding rod applied by the arc-welding method. All surfaces are finish ground with a hand grinder.

Many thousands of crossbearers have been made with these dies and they are readily brought back to correct size by building up of worn surfaces by welding. They are not flame hardened but, in use, a service hardening occurs in the weld metal used on the wearing surfaces.

General Utility Sealing Compound

The Johns-Manville Co., New York, is marketing a non-hardening adhesive sealing and caulking compound under the trade name of Duxseal. Used like putty, the compound sticks readily to any clean surface without flowing, slumping or hardening in service, and is suited to a wide range of uses. It is insoluble in water, unaffected by ordinary gases and condensates, and does not injure the hands. It is in use in electrical, maintenance, mechanical, plumbing and other work. The compound is black in color and weighs 100 lb. per cu. ft.



Machine developed for boring floor boards at the McComb shops of the Illinois Central

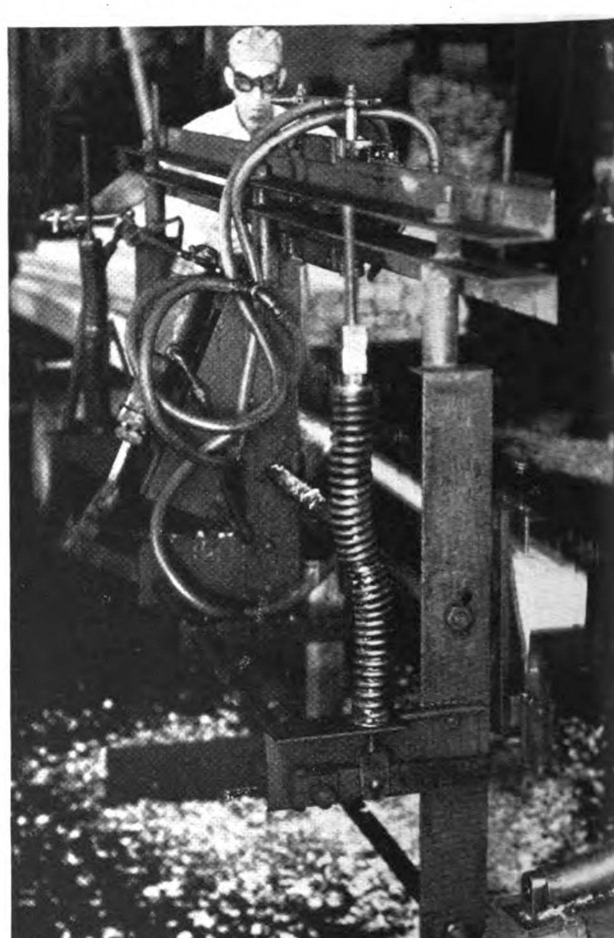
Boring Car Decking for Rivet Head Clearance

The machine for boring freight-car decking for rivet-head clearance, shown in the illustrations, was developed by E. L. Bowen, machinist, Illinois Central, McComb, Miss., who received an I. C. Suggestion Award of $200 for this proposed method of increasing efficiency and cutting car repair costs. Mr. Bowen's suggestion was one of 205 for which the Illinois Central awarded a total of $2,075 during the month of June.

Previous to the use of this machine at the McComb car shops, the floor boards in solid-bottom coal cars, for example, were gained by the use of one air motor, an apprentice and a helper finishing about 100 boards an hour. The machine illustrated was constructed to do this work at less expense and the present output is 200 pieces an hour. While the new machine increases job efficiency and reduces repair costs, its use also contributes to returning coal cars to service in less time than before, thus making more cars available for defense loads and assisting in the war effort.

Referring to the illustrations, it will be observed that the machine is made up principally of structural shapes, the frame consisting of three vertical angles in a row, held together by two tie rods with pipe spacers and having across the top two angles, one above the other, with the vertical flanges turned in opposite directions. On these angles are mounted two No. 262 Thor reaming motors in frames which permit them to be adjusted longitudinally to suit the spacing required. The spindles of the motors have been bored to suit wood bits and heavier springs applied to the governors to increase the speed to suit. Three angles are mounted below the motors, two of which act as a clamp for the decking. One of the latter is gibbed to the vertical members, to slide freely, and the other is attached to it by suitable brackets and small air cylinders which serve to clamp the decking. The lighter angle is attached to the one above it and serves to hold the guides for the bit centrally over the pieces to be bored. There is a shaft running lengthwise with arms that are attached by links to the clamp. At the back of the machine is a Shoemaker firedoor cylinder connected to a center arm of the shaft. This cylinder raises and lowers the clamp and is operated by the usual foot valve. Counterbalance springs reduce the load on the cylinder. One operating valve controls the motors and the air clamps. A lengthwise shaft underneath operates a stop at the end of the clamp.

The operation of the machine is as follows: the stop is thrown in place and two pieces of decking (faced in opposite directions) are shoved against it. The operating valve is opened and this clamps the material and starts the motors. The foot valve is depressed, which causes the clamp to raise and bore the pieces. The foot valve is released, the operating valve closed and the stop thrown out of the way, which lowers and releases the work, allowing it to be pushed out by the following pieces. A truck load of material is placed at the operating end of the machine and fed through, two facing pieces at a time, by the operator and removed and loaded on a truck by a helper located at the opposite end.



The back side of the machine

(*Turn to next left-hand page*)

High Spots in
Railway Affairs . . .

Railroad Labor Shortage

Otto S. Beyer, director of the ODT Division of Transport Personnel, announced on November 15 that a survey of railroad labor conditions indicated that there was a "real and critical shortage of railroad labor." He suggested three measures to overcome this shortage—increased employment of women, centralization of personnel activities and modernization of training programs. The survey showed that 101 Class I railroads now employ about 40,000 women, of which 34,000 are engaged in clerical work. During the first World War the railroads employed approximately 100,000 women and Mr. Beyer suggested that they could probably employ a much greater number now. Of the roads reporting, almost half have no organized programs for training employees and many of the others have only very limited projects. Some roads have made special provision for training foremen and other supervisors in ways to break in new men assigned to work under them. One of these railroads is said to have 1,181 supervisory employees enrolled in such courses, given by federal and state agencies.

Eastman on Federal Operation of Railways

The program of the annual meeting of the Academy of Political Science was this year dedicated largely to a discussion of transportation in wartime. A program of this sort would necessarily include an address by Director Eastman of the Office of Defense Transportation. In explaining the steps that have been taken to avoid congestion at ports and elsewhere, Mr. Eastman told of the co-operation given to the railroads by shippers, the Army and Navy, the Shipping Administration and the ODT. Near the close of his address, in commenting upon the possibilities of federal operation of the railroads, he said: "The present co-operative arrangement is, I believe, working well, and certainly it is receiving loyal and wholehearted support from both the carriers and the shippers of the country. No one could wish for any better co-operation than I have received from both of these sources, and spirit and morale are at very high levels. Moreover, it is possible, through the present arrangement, to realize many of the advantages of unit operation, and the possibilities in this respect have by no means been exhausted. In the circumstances I can see nothing substantial to be gained by changing the arrangement, and I am also sure that if we were to embark upon a program of government acquisition and operation, it would have an immediate demoralizing effect which it would take some considerable period of time to correct, besides introducing many troublesome problems in connection with the acquisition and the compensation therefore, which would absorb the attention of many who now have none to spare."

Railroad Needs in The War Emergency

The Guaranty Trust Company of New York, in its monthly economic review in the Guaranty Survey, discusses the efficient operation of the railroads under private control during the present emergency, as contrasted with conditions during government operation in the first World War. In its opinion, it finds that the carriers have two outstanding needs: (1) That they should be provided with a sufficient supply of materials and equipment to continue the excellent record of service they have thus far maintained (the present transportation situation in Germany was held up as evidence that there are few needs more urgent than that of keeping the rail transport system at the peak of efficiency), and (2) that they should be permitted to retain a sufficient portion of their earnings to sustain credit, encourage adequate maintenance of facilities and to bolster their financial position, which still shows the effects of long years of reduced income. It was the opinion of the Survey that railway labor, shippers groups and public authorities have too often been inclined to seize upon any increase in railway earnings as an opportunity to make new financial demands on the carriers.

Jeffers Comments on Labor and Management

W. M. Jeffers, president of the Union Pacific and national rubber administrator, is noted for speaking frankly and straight from the shoulder. With his direct businesslike approach he has done much in a few short weeks, to bring order out of chaos in the rubber situation. In discussing another phase of our economic life and one in which he is well versed, "Men and Management in America," he made the following statement before the New York Herald-Tribune Forum on November 16: "Management has been short-sighted in the exertion of its power in times past when it should have elected to guide rather than to rule. Labor has been equally as shortsighted when it tasted new-born power in recent years and in misguided efforts to protect its gains, particularly in the past few months, has risked the good will of the public. These things must pass in order that we may win the victory and must permanently be discarded if we are to win the peace."

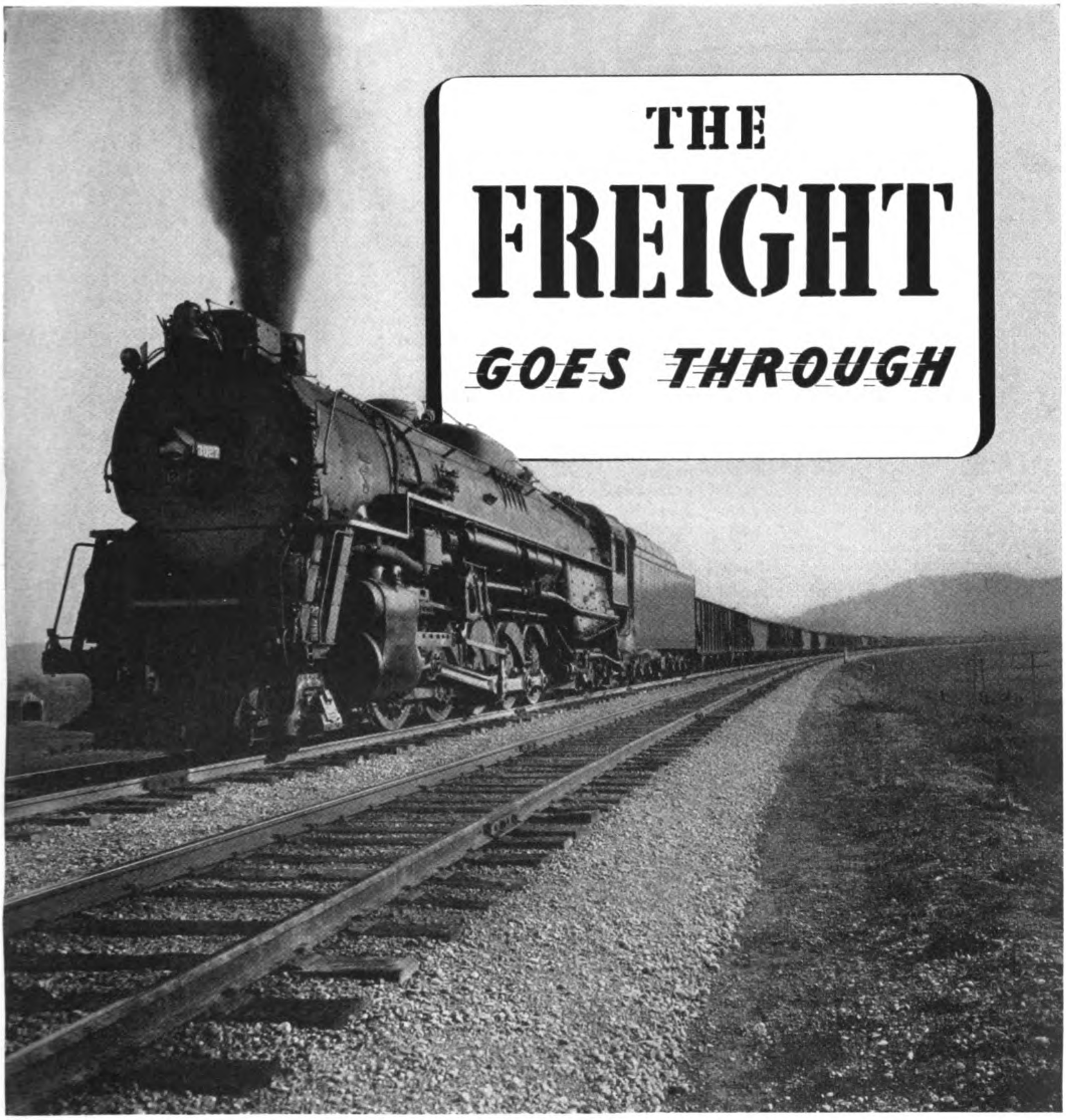
Post-War Planning

If much thinking and planning to meet post-war problems can be helpful, then certainly the aftermath of the present world conflict should be very different from that of the first World War. Ralph Budd, in speaking before the recent meeting of the American Railway Bridge and Building Association, said that, "A word should be said about the prospect of the railways after the war and what, if anything, can be done at this time about them. . . . I am one of those who believe that the expenditure of funds by government can never take the place in a free society of the very much larger expenditures which free enterprise can produce. . . . The railroads will not lag in the initiative and ingenuity to take care of themselves if they are given the proper atmosphere of regulation. For the time being we have had to give up a great many technological advances and advantages because certain materials are not obtainable, but immediately when they become available again, we will start where we left off, or perhaps a little further along, and I venture to say that there will be no lack of projects and no lack of employment and productivity, if we are given the proper support from those under whom we must work."

The Oil Movement To the East Coast

Several factors combined to slow up the movement of petroleum and petroleum products into the eastern states after the high record was reached of 856,710 barrels a day during the week ended September 19. Director Eastman, in speaking before a meeting of the American Petroleum Institute in Chicago in mid-November, said that he had not lost hope that the movement would be increased to over 850,000 barrels per day. He pointed out several favorable factors. He then listed the unfavorable ones as "the coming winter, which will slow traffic, particularly if the weather is severe; the strain on railroad motive power of increasing war traffic and troop movements; and the condition of the cars." The ODT has appointed a maintenance committee, which is surveying the physical condition of tank cars transporting petroleum into the East. It has been asked to determine the adequacy of repair facilities, considering the location of shops, class of repairs, supply of labor, availability of materials and other factors; also to report on current methods of inspection and running repairs, making recommendations for improvements. It is also giving consideration to the possibility of establishing general repair shops or shops for light and medium repairs at or near major points of origin and destination.

(Turn to next left-hand page)


THE
FREIGHT
GOES THROUGH

NEWS

AA-1 Priority for Repairs and Maintenance

THE War Production Board's Requirements Committee on November 11 authorized that the top priority rating of AA-1 may be applied to essential repair and maintenance. Included in the scope of the determination, "a basic policy for the first quarter of 1943," are "transportation systems," which are listed among industries to be "assured of materials to keep them performing their essential functions."

WPB Revises Steel Restrictions

REVISED iron and steel conservation order M-126, announced by the War Production Board November 5, includes some minor changes that affect the use of iron and steel, including stainless steel. The use of iron and steel is entirely prohibited for a long list of new items, but an exception is provided for the delivery of roofing and siding "for the maintenance and repair of railroad freight cars, street cars, and buses." Lead is no longer included in the list of materials that may not be substituted for iron and steel.

WPB Advises on Car Designs and Steel Plates

MAKING "a further effort to simplify various designs of freight cars for general service," the Transportation Equipment Branch of the War Production Board has requested car builders to restrict to seven designs their production of gondola, hopper and flat cars for general service under Limitation Order L-97-a. The request came in a letter from Branch Chief Andrew Stevenson, who has also recently advised that the steel-plate situation has changed to permit removal of the restriction to plates not more than 48 in. in width.

The car designs suggested in the letter to car builders are as follows:

Gondola Cars

Drawing No. 5-1918—50-ton composite gondola—41 ft. 6 in. inside length.
Drawing No. 5-1919—50-ton composite gondola—41 ft. inside length, 16 steel drop doors, steel fixed ends.
SK-F-5163-C—70-ton composite gondola—52 ft. 6 in. inside length, low side and steel drop ends.

Hopper Cars

SK-7-13-42-B-B—50-ton composite hopper—33 ft. inside length.
SK-7-13-42-C-B—70-ton composite hopper—40 ft. 8 in. inside length.

Flat Cars

Drawing No. 510-F-54-A—50-ton flat cars—53 ft. 6 in. length.
Drawing No. 17592—70-ton flat cars—53 ft. 6 in. length.

The announcement said that these designs were discussed at a meeting of WPB officials and car builders, adding that "designs for composite type box cars are under consideration and will be announced within the near future."

The statement with respect to steel plates recalls that for the past several months "restrictions have been in effect providing that plate for railroad maintenance and repair, for car construction and for locomotive construction be limited to not more than 48 in. in width except for firebox and boiler steel, for certain tank-car construction and for bridges and turntables." It goes on to advise that conditions now permit modification of the restriction to allow use of plates not wider than 72 in., adding that plates are most readily available "in widths ranging from 36 to 72 in., inclusive, when they can be ordered in quantities of not less than 10 tons of an item and in carbon steel of structural grade."

Thus, it is suggested that "every effort be made to consolidate orders," and attention is called to the fact that in many cases the mills can avoid delay in shipment if authorized to substitute Bessemer for open-hearth steel. The restriction to not over 72 in. does not apply to firebox and boiler steel, steel for high pressure tank cars, or for bridges and turntables.

* * *

Charles E. Brinley, president of the Baldwin Locomotive Works, alighting from the cab of one of the new Pennsylvania Class T-1 locomotives—During a recent trip to Chicago Mr. Brinley boarded the cab of Locomotive 6111 at Crestline, Ohio, and rode to Fort Wayne, Ind., a distance of 131 miles, to observe the performance of these 4-4-4-4 type passenger locomotives built by Baldwin

WPB Equipment Allotments Disappointing

PROSPECTS for obtaining what the railroad industry regards as adequate new equipment for 1943 now rest on the hope for later readjustment of the present eight-months' authorizations for 250 steam locomotives and 36 road Diesels, and the six-months' authorizations for 100 Diesel switchers and 20,000 freight cars. Projecting these figures on an annual basis would indicate a 1943 program calling for 629 locomotives, 271 fewer than the 900 sought by the railroads, and 40,000 cars, or just half of the 80,000 requested. As had been anticipated, no new passenger car production was authorized. Meanwhile, the authorizations of steel for maintenance of way and equipment have been appraised in railroad circles as fairly adequate. These steel allotments, all for first quarter delivery in 1943, are: rail, 480,000 tons; track accessories, 288,000 tons; repairs to equipment, 330,000 tons. On an annual basis, these would indicate 1943 totals as follows: rail, 1,920,000 tons; track accessories, 1,152,000 tons; repairs to equipment, 1,320,000 tons.

The authorizations determined recently by the War Production Board's Requirements Committee were announced on November 19 following a meeting at which Andrew Stevenson, director of WPB's Transportation Equipment, outlined the program to his Transportation Equipment Industry Advisory Committee, consisting of builder and railroad representatives. That meeting was followed by other sessions at which determinations were made as to the allocation of production among contract-builder plants and railroad shops.

The railroads' immediate reaction was one of disappointment in the equipment authorizations, the disappointment finding expression mainly in comments on the locomotive program, for while there was no satisfaction with the car program either, it was pointed out that cars are of little use in a period of motive-power shortage. It is understood that the locomotive program finally recommended by Director Eastman of the Office of Defense Transportation and the Association of American Railroads' presentation calling for 900 were not far apart. And while the A. A. R. presentation was on an October-to-October basis as compared with the calendar-year-1943 basis of the authorizations, the carry-over balances out to make substantially correct the above statement to the effect that if the present authorizations are carried forward on nothing more than a pro-rata basis, the locomotives forthcoming during the next year will be 271 short of the estimated requirements.

In other words, the eight-months' program for 250 steam locomotives and 36 road Diesels would, if extended for 12 months, bring 125 more of the former and

(*Continued on next left-hand page*)

18 more Diesels, or totals of 375 and 54, respectively, mentioned at the outset. Likewise, the 100 Diesel switchers authorized for six months would become 200 for the year. Hence, a 12-months' program for only 629 locomotives as it is indicated at this time. The Diesel-switcher situation is causing some concern, for the authorization in that connection is reported to represent a drastic cut under the railroad proposal. It has been suggested, however, that switcher production from the 250 steam locomotives authorized might bring some relief.

With respect to the car program, all 20,000 will be open tops. While Director Stevenson's meeting with his advisory committee was not open to the press, it was learned that the discussions there included considerable talk about standardization of designs and concentration of construction. As noted elsewhere in these columns, the Transportation Equipment Division recently requested car builders to restrict to seven designs their production of gondola, hopper, and flat cars for general service under Limitation Order L-97-a. The 1943 car program recommended by ODT to WPB was not made public, but it is reported to have called for between 73,000 and 74,000 cars as compared with the railroad request for 80,000.

WPB's November 19 announcement of the authorizations said that its action would enable railroads "to place promptly the major portion of their orders for rails and equipment to assure delivery on schedule." Ferdinand Eberstadt, WPB vice-chairman in charge of program determination, appeared at the advisory committee meeting and is reported to have told the builder and railroad representatives that they had the "green light" to go ahead on the authorized program. In other words, it was emphasized that the necessary materials would actually be forthcoming under allocations.

It was also pointed out at WPB that the new Controlled Materials Plan (see page 546) which is being launched on a gradual basis to become fully effective next July 1, embodies procedures for resurveys and redeterminations of programs on the basis of new developments in the materials situation. Under such a set-up, the railroad industry would seem to have some basis for hope in recurrent reports to the effect that the next six months will bring an easing of the steel situation.

Such reports are based on the fact that substantial non-recurring demands for steel used in war-plant construction are well on the way to satisfaction. These include plants now building for the production of synthetic rubber, aviation gasoline, and aircraft engines. It has been suggested at WPB that as those facilities are completed —and they are reaching that stage—more steel should become available for other allocations. Also, there has been some thought that the African campaign, though it brings new army demands for rolling stock, might nevertheless make a substantial net contribution to an easing of the over-all steel situation, if one result should be such a shortening of United Nations' communications lines as to alter conditions with respect to steel required for shipbuilding.

Previous to the above announcement from Washington, the minimum equipment requirements of the railroads were placed at 1,000 locomotives, 100,000 freight cars and 2,000,000 tons of rails, by Ralph Budd, president of the Chicago Burlington & Quincy; Henry A. Scandrett, trustee of the Chicago, Milwaukee, St. Paul & Pacific, and Arthur H. Schwietert, traffic director of the Chicago, Association of Commerce, representing the shippers, in a round table discussion of Our Astounding War Transportation Machine, conducted by the Union League Club of Chicago on October 29. The discussion, over which Samuel O. Dunn, chairman of the Simmons-Boardman Publishing Corporation and editor of the Railway Age, acted as moderator, was attended by 700 representatives of the railroads, the shippers and the public.

The equipment needs of the carriers are also stressed by the Transportation and Communication Department Committee of the Chamber of Commerce of the United States in a report on "Transport Conservation," recently prepared by the committee and approved by the Chamber's board of directors. This report urges upon the War Production Board "special consideration of the need for a proper balance between production and transportation, in allocating materials for transportation equipment and maintenance, even though this may require materials that would otherwise go into war equipment.

Railway Activities of Engineers Corps Transferred to Transportation Corps

All Army activities connected with the operation and maintenance of railroads, which were formerly a function of the Corps of Engineers have been transferred to the Transportation Corps, Service of Supply, according to a November 16 announcement from the War Department. Included in the transfer is the Military Railway Service, headed by Brigadier General Carl R. Gray, Jr.

The Transportation Corps, headed by Major General Charles P. Gross, was created last August "to co-ordinate, direct, and speed the flow of men, equipment, and supplies into the war effort." Its new jurisdiction over the Military Railway Service will be complete, the November 16 announcement said, covering that Service's engineer headquarters and headquarters companies, all grand divisions, all operating and shop battalions, and all other units and reserve components.

"Many installations and large numbers of Army personnel," the announcement also said, "are involved in this move for the centralization of control over military transportation. All activities and installations permitting to research, design, development, procurement, storage, and distribution of railway rolling stock for the War Department, which were formerly under the jurisdiction of the Corps of Engineers are included in the transfer." Meanwhile, however, new railway construction for the Army will continue to be the responsibility of the Corps of Engineers.

Among the military personnel affected are "all officers of the Corps of Engineers or other components of the Army whose primary assignments were in connection with the transferred activities." In addition to the personnel of the Military Railway Service, these include personnel of the Railway Branch, Troops Division, and the Railway Equipment Section, Procurement Branch, Supply Division, Office of Chief of Engineers. Civilian personnel engaged primarily in the transferred activities have also been placed under the jurisdiction of the Transportation Corps.

Brazilian Train Uses Diesel Oil from Coal Deposits

A Diesel train of the Central Railroad of Brazil recently completed a round trip from Rio de Janeiro to Sao Paulo using Diesel oil extracted from bituminous deposits from the State of Rio Grande do Sul. The new motor fuel is said to have given ample satisfaction. Brazilian coal, on the whole, is of lower grade than the imported coal on which Brazil formerly depended.

Training Workers in the Care and Use of Carbide Tools

The Carboloy Company, Inc., Detroit, Mich., has developed a series of six 35 mm. silent slide films designed to expedite the training of new workers in the use, care and handling of carbide tools. The films are based largely on experience gained over several years in the operation of a training course at the Carboloy plant in Detroit and are being distributed at print cost for use as a permanent part of war-training programs by industrial concerns and education institutions, etc. Arrangements are also being made for free loaning to educational institutions through film libraries maintained by colleges. The films depict cemented carbide; designing and brazing cemented carbide tools; chip breakers and their application; grinding single-point carbide tools, and putting cemented carbide tools to work.

WPB Office of Production Research and Development

Chairman Donald M. Nelson of the Office of War Information, War Product Board, has announced the establishment of an Office of Production Research and Development in the War Production Board, with Dr. Harvey N. Davis, president of the Stevens Institute of Technology as its director. The office has been set up to insure rapid appraisal and the quickest and most effective utilization of processes, materials, mechanisms, and inventions in the production of war goods. It will parallel in the production field the work already being done in regard to instruments of war by the Office of Scientific Research and Development. Its four principal functions will be:

(1) To provide the chairman with technical information on problems with which he is directly concerned and on research and development work in progress in WPB. The office is also to provide the WPB divisions and branches

(Continued on next left-hand page)

with research information and findings on work which they have in progress.

(2) To initiate evaluation and analysis of specific scientific or technological proposals, through the establishment of export committees or through reference to existing research groups in government, education, or industry.

(3) To get needed research accomplished by contracting with outside laboratories or agencies for experimental work.

(4) To bring about development of such projects or processes as are found to merit it, through contracting for the construction of prototypes or the erection of pilot plants.

Except for contracts connected with the rubber program, all contracts for research and development work by other governmental agencies, colleges and universities, commercial laboratories and corporations, and others will be handled by Director Davis who will consult with the WPB Director General for Operations and with the head of the branch or division involved before undertaking any program.

WPB Critical Materials Control Plan

THE new Controlled Materials Plan (CMP) adopted by the War Production Board to adjust requirements for critical materials to the available supply will, according to WPB Chairman Donald M. Nelson, "insure the railroads in getting their proper proportion of materials essential to do their job" at the time they are needed.

The new plan will become fully operative next July 1, but it will gradually become effective in different industries before then as they are ready for it, replacing the present priority system. Mr. Nelson mentioned the railroad industry as one that would "go ahead very fast" under the new control mechanism.

The critical materials to be controlled under the new plan from the start are aluminnm, copper, and carbon and alloy steels. It is expected that other materials may be added to this list later, but these three are regarded as key materials, the allotment of which will in large measure establish control over all industrial production.

As far as the three affected critical materials are concerned, the new plan succeeds other distribution systems by which WPB has sought without complete success to balance supply and demand.

The CMP program is based on a "vertical allotment" method of distributing materials, in which seven "Claimant Agencies" become in effect the distributors of all the available supply of the three critical materials, allotting their shares of the supply to prime contractors producing essential goods, who in turn divide these allotments with their suppliers and subcontractors. The process of division may be carried on as far as the chain of subordinate contractors extends in an individual industry, arriving in the end to the supplier of the raw materials.

The seven Claimant Agencies set up under the plan the the Army, Navy, Maritime Commission, the Aircraft Scheduling Unit (in which is consolidated material control for all aircraft production), Lend-lease, Board of Economic Warfare, and Office of Civilian Supply. The latter office, which is the claimant agency for all producers not otherwise represented—including producers of railroad materials and equipment—will assemble its estimates of requirements with the aid of the various WPB industry branches.

According to Leon Henderson, director WPB, Office of Civilian Supply, the more essential "civilan" products, including railroad equipment and materials, will get relatively larger allotments of the controlled scarce metals, but, in his words, his agency, in programming the quantities needed of "end-products"—railroad cars, for example—will "not sell tickets for more seats than there are in the theater."

To give the WPB industry branches "greater strength" to handle the job of informing the Office of Civilian Supply on the resources and needs of each industry, Ferdinand Eberstadt's office of rogram determination is reorganizing them, it was announced on November 3. To as great an extent as possible, each industry branch will follow a similar pattern.

Functioning of the new CMP through the Office of Civilian Supply will follow in a general way the pattern of present operations, Mr. Henderson explained, but three new factors have been introduced: Bills of materials, allotment numbers, and inventory control. Under the new plan prime contractors will prepare and submit a breakdown of all materials required for the "end-products" they are producing. This breakdown will constitute a bill of materials which will specify what materials are required and when they must be received.

All bills of materials will be assembled periodically by the Office of Civilian Supply and the other six Claimant Agencies and submitted to the WPB Requirements Committee, indicating separately requirements for production, for construction, and for maintenance and operation. It is intended that such programs shall be worked out and requirements submitted on a quarterly basis for a period of 18 months in advance. Requirements for construction, including industrial machinery and equipment, will be handled through a special channel, the Construction and Facilities Branch of the Office of Program Determination.

The assembled statements of requirements will pass through Controlled Materials Branches—one for each of the materials alloted under the new plan—which will "make the necessary adjustments" to bring requirements into balance with available supplies. When the programs of the Claimant Agencies have been adjusted and approved, the vice-chairman in charge of program determination will, with the advice of the Requirements Committee, of which he is chairman, allocate the available supply of the controlled materials to the seven Claimant Agencies. These agencies then will distribute thse allotments among their prime contractors by means of allotment number, "which will constitute a right to receive delivery." These allotment numbers will be passed on from contractor to subcontractor to supplier as necessary.

Materials other than the three controlled materials will continue to be distributed through the priorities system unless the CMP is extended to cover them later. Each producer receiving an allotment number will receive also a preference rating for obtaining other materials, and these preference ratings will "resolve conflicts" in the production and delivery of manufactured articles.

The first bills of materials will be assembled by the Claimant Agencies between now and January 1, so that they can at that time "program the quantities of end-products"—such as freight cars—most urgently required and submit a consolidated estimate of materials needed to the Controlled materials Branch. On February 1 the Requirements Committee will allot controlled materials to each Claimant Agency for the second quarter of 1943. Distribution of allotments through contractors and suppliers will follow, and by March 15 users will have placed orders for delivery in April and later months, according to the CMP timetable.

In addition to the controlled materials, the scarce materials include such metals as zinc, tin, nickel and cadmium, and also a variety of raw materials, including rubber, cordage fibers, rayon, mica, nylon, and wood.

Separate classifications are provided for many shapes and forms of these scarce and controlled materials, so that the steel product classification includes among others rails and track accessories, steel castings, wheels and axles, structural shapes, and sheets and plates. Code numbers are specified for including each of this large variety of shapes and qualities of material in the bills of materials required from each producer.

Tank Cars Should Get Steel Wheels

THE A. A. R., Mechanical Division, reports in a recent circular letter to the members and to private tank-car owners that tank-car repairs and maintenance were thoroughly dicussed at a meeting of the Tank Car Service Executive Committee, Office of Defense Transportation, held at the William Penn Hotel, Pittsburgh, Pa., on Wednesday, September 16, 1942. At this meeting a resolution was passed to the effect that, in co-operation with the A. A. R., all car owners and carriers be urged to expedite the application of truck-spring snubbers and the substitution of wrought-steel wheels for defective cast-iron wheels to tank cars, as expeditiously as available material will permit.

A representative of the Office of Defense Transportation advised those present that the ODT would give every assistance possible for procuring material necessary to accomplish these applications as soon as possible, so that lost time due to tank cars out of service for repairs will be reduced.

In event the application of one-wear wrought-steel wheels is authorized by the car owner and such wheels are not available, railroads and car owners are requested to apply new cast-iron wheels (if available) in place of defective wheels. When wheels are renewed in kind, railroads and car owners are requested to apply new wheels so far as possible, whether or not owners or delivering-line defects are involved.

Private tank-car owners are requested to advise promptly if they will authorize railroads to apply one-wear wrought-steel wheels (preferably new), or new cast-iron wheels, where available, in place of defective wheels, without penalty, irrespective of owners or handling line defects, billing them for the betterment charge involved, in accordance with the allowances shown in the interchange rules.

The ODT has requested that it be advised currently the number of cars equipped with spring snubbers, this information being furnished through the medium of monthly reports to the A. A. R., Mechanical Division. The ODT also advises that their service representatives have found that some of the inspections being made by the tank-car companies at the unloading racks are not as complete as they should be, and in some cases inspectors are not used on all three shifts. This allows some tank cars to be unloaded and returned to the railroads for empty movement without any inspection. Each tank-car owner is requested to make investigation at its unloading points, and if any of them are not equipped to make inspection, necessary arrangements must be made so that all cars will receive proper inspection and repairs before they are placed in trains for movement.

This co-operation is earnestly solicited to the end that the flow of petroleum products to the eastern seaboard may be expedited.

A. A. R., Mechanical Division

Conservation of Rubber

In a recent circular letter, the Mechanical Division, through its Committee on Brakes and Brake Equipment, has approved and recommends the following specifications for the reconditioning of used gaskets to conserve the rubber required in manufacturing these gaskets:

The gaskets to be treated under this specification are only those which have been removed from valves returned for cleaning, and which are to be replaced in valves for continued service.

The object of this treatment is to clean the gaskets, to restore their flexibility, and to restore the height of the beads, so that they will form a better seal when they are reassembled.

The gaskets shall be immersed in a tank of boiling water for one hour. After this period they shall be laid on a bench and the excess water wiped off with a cloth. The gaskets shall then be brushed with a soft bristle brush (such as a shoe brush) to remove any remaining dirt and to polish them.

After this treatment the gaskets shall be assembled in valves as soon as possible instead of being stored.

Car Equipment Delayed Awaiting Repair Materials

In another circular letter the Mechanical Division points out that excessive delays are being experienced in making repairs to freight and passenger cars on foreign roads, where necessary to order repair material from owner and requests are transmitted by mail. This is particularly true where shops of the car owner and the repairing line are separated by a considerable distance.

Due to the urgent demand for passenger, tank and open-top cars, when necessary to request material for repairs to such foreign cars from car owner, orders should be transmitted by telegraph, telephone, or air mail, and material forwarded the same day if possible. Any material weighing less than 250 lb. gross weight must be shipped by express, as specified in Rule 122.

The same method of handling requests for material should be followed between the repair point where a car is held and the office of the repairing line which transmits such requests to the car owner. The letter emphasizes the importance of this matter under present conditions and urges that it be brought to the attention of supervisors and all others concerned, in order to avoid all possible delay in returning cars to service.

1941 Proceedings

The Proceedings of the Mechanical Division session held at the Jefferson Hotel, St. Louis, Mo., June 19-20, 1941, are available through the Association of American Railroads, Operations and Maintenance Department, 59 East Van Buren street, Chicago, at a cost of $4 to members; $8 to non-members. They contain 466 pages and include the reports of committees and discussion at that annual meeting and the recommendations of committees submitted to letter ballot of the members by authority of the General Committee.

Beyer Urge Labor Training Programs

A survey of railroad labor conditions has disclosed that on 101 Class I railroads there were 60,000 vacant jobs on September 15, Otto S. Beyer, director of the ODT Division of Transport Personnel announced November 15. This figure, he explained, does not mean that there were actually 60,000 vacancies that could not be filled, since it includes the normal turnover of employees that accounts for a substantial number of vacancies on any given day, but, he added, it does "reveal a real and critical shortage of railroad labor. Responses to the survey, moreover, specifically indicate that the carriers are encountering extreme difficulties in meeting many shortages."

Mr. Beyer called upon the railroads to adopt three measures to meet this growing problem of labor shortage—increased employment of women, centralization of personnel activities, and modernization of training programs. Of the 101 Class I roads reporting in the survey, 47 have absolutely no organized programs for training employees, he said, and many of the others have only very limited projects.

The survey indicated that the railroads are meeting particular difficulty in filling apprentice jobs, as eligible young men show little interest in a long apprenticeship when an abundance of well-paying jobs are available and induction into military service is more or less imminent.

Some railroads have met with success in instituting training programs, the survey disclosed, and others are now engaged in overhauling their methods to meet current conditions. While such training programs seldom include formal classes for the instruction of new employees, it was pointed out that the traditional on-the-job training procedures have been accelerated and modified. On some roads special courses have been set up to train foremen and other supervisors in ways to break in new men assigned to work under them. One railroad was said to have 1,181 supervisory employees enrolled in such courses, given by federal and state agencies.

Milwaukee Broadens Safety Work to Conserve Manpower

A program of accident prevention which concentrates upon the proper training of employees as a means of conserving manpower and insuring the continuity of the railroad's war efforts has been adopted by the Chicago, Milwaukee, St. Paul & Pacific. To carry out the program, eight newly appointed district safety engineers have each been assigned territories and will be held responsible for the training and safety of employees in their districts.

Men for the newly created position were selected from supervisory ranks on the basis of their accident records as supervisors, their activities among employees and recommendations of superiors. Under the program they will be in direct contact with all branches of railroading in their districts, will train supervisors, will spend time on the line checking performance and will attend all employee meetings.

The eight new district safety engineers and their headquarters are as follows: Otto C. Stainer, Chicago, formerly a freight service inspector; William A. French, Milwaukee, Wis., formerly a machine shop foreman; Roy A. Dahms, Milwaukee, formerly a general track foreman; Clifford W. Riley, Ottumwa, Ia., formerly a conductor; Martin L. Medinger, St. Paul, Minn., formerly a boiler shop foreman; Frank M. Washburn, Minneapolis, Minn., formerly a general car foreman; H. J. McMahon, Miles City, Mont., formerly a superintendent's chief clerk; and T. E. Corbett, Tacoma, Wash., formerly a chief dispatcher.

WPB's Railroad Salvage Director Gets New Title

B. C. Bertram is now chief of the Railroad Unit, Conservation Division, War Production Board, his title having been changed from that of salvage director for railroads.

American Steel Foundries Armor Plant Producing

Ceremonies marking the opening of the new cast armor steel foundry of the American Steel Foundries at East Chicago, Ind., were held on October 29. Addresses were

(Continued on second left-hand page)


100% Incr
T.R.R.A.
150,000
Average revenue carloads handled monthly by the Terminal Railroad Association of St. Louis in 1938 to May 1942.
75,000
554
GM DIESEL SWITCHERS DELIVER VICTORY TRANSPORTATION
Because They
• Speed yard movements with safety and minimum damage to lading and equipment
• Reduce operating costs 50 per cent
• Reduce fuel expenses 75 per cent
• Operate at 94 per cent availability
• Conserve equipment — GM locomotives in all classes of service are replacing two to four times as many steam locomotives, thus releasing hundreds of steam locomotives for other important services
• Conserve vital materials — One ton of materials in a GM Diesel will do the work of more than two tons of materials in a steam locomotive.
TRANSPORTATION IS VITAL FOR VICTORY
GENERAL MOTORS LOCOMOTIVES
ELECTRO-MO
GENERAL MOTORS CORPORATION

made by Thomas Drever, president of the company, and Brigadier General Donald Armstrong, chief of the Army's tank automotive center at Detroit, Mich. The new plant, one of the largest steel foundries in the country, was built to meet the demands of the combat section of the Army Ordnance department for a large tonnage of cast armor for tanks. The project was a co-ordination of the engineering skill of the personnel of American Steel Foundries and agents of the Defense Plant Corporation which furnished the necessary funds of $26,500,000. In less than one year from the time when architects and engineers were instructed to prepare plans, a heat of cast armor steel was poured into molds.

Alco Sponsors Diesel Shop Battalion

THE American Locomotive Company recently sponsored the 762d engineer railway Diesel shop battalion, United States Army, following an invitation to the company to do so from the corps of engineers. The suggestion that the company sponsor the battalion was first made to Duncan W. Fraser, president of the American Locomotive Company, by Colonel Lewis T. Ross of the railway branch, troops division, corps of engineers, and Mr. Fraser agreed to the recruiting of personnel from all phases of the company's operations, including clerical help, in order to insure that there would be in the unit complete familiarity with every aspect of Diesel locomotive maintenance. Major William Rogers, formerly a district service engineer for the American Locomotive Company, is senior officer in the battalion, and others who have accepted commissions are Captain George F. McGowan, formerly a survey engineer, and Lieutenants Charles C. Davis, John D. Coleman, Myron A. Tenney and W. E. Sagstetter, all of whom were Diesel service engineers. Other personnel was drawn from the General Electric Company, the Westinghouse Air Brake Company and the Exide Battery Company. In each instance the men selected were specialists in some phase of Diesel engine maintenance. The battalion was recently activated.

Selective Service Rates Equipment Building as "Essential"

THE Selective Service System has issued Occupational Bulletin No. 38, calling to the attention of local draft boards a War Manpower Commission certification that the production of transportation equipment is an activity essential to the support of the war effort. The bulletin lists 88 "critical occupations" in the equipment-building industry.

Like previous bulletins, it suggests that, in classifying registrants employed in these activities, local boards should give consideration to the training, qualification, or skill required for the occupation; the training, qualification, or skill of the registrant; and the availability of persons with qualifications or skill, or who can be trained to replace the registrant, and the time in which such replacement can be made.

Supplementary List of Snubber Applications

RECENT circular letters to members of the A. A. R. Mechanical division, and to tank car owners about the application of spring snubbers to tank car trucks have now been supplemented by revised and amplified lists of (A) Private car owners who have agreed to permit railroads to apply snubbers to truck spring clusters of their cars; and (B) private car owners who advise with respect to application of truck spring clusters on their cars that (1) all of their cars are already equipped, or (2) the necessary snubbers have been purchased and will be applied by their own forces, or (3) arrangements have been made with one or more railroads over which their equipment moves to apply these devices to their cars.

The list of private tank car owners who have agreed to permit the railroads to apply snubbers to truck spring clusters of their cars includes 47 car owners with an ownership of 55,121 cars. Those with cars already equipped, necessary snubbers purchased and being applied by their own forces, or arrangements made for application by one or more railroads over which their equipment moves include 43 car owners with an ownership of 50,586 cars.

* * *

New WPB Committee to Evaluate Labor Requirements

A LABOR Requirements Committee has been organized by the War Production Board to aid in co-ordinating that agency's activities with those of the War Manpower Commission, WPB Chairman Donald M. Nelson has announced. The chairman of the new committee is Ferdinand Eberstadt, WPB vice-chairman in charge of program determination, and its vice chairman is Carl J. Goff, assistant president of the Brotherhood of Locomotive Firemen & Enginemen. Altogether ten government agencies are represented on the committee including O.D.T., represented by Edwin M. Fitch, assistant director, Division of Transport Personnel.

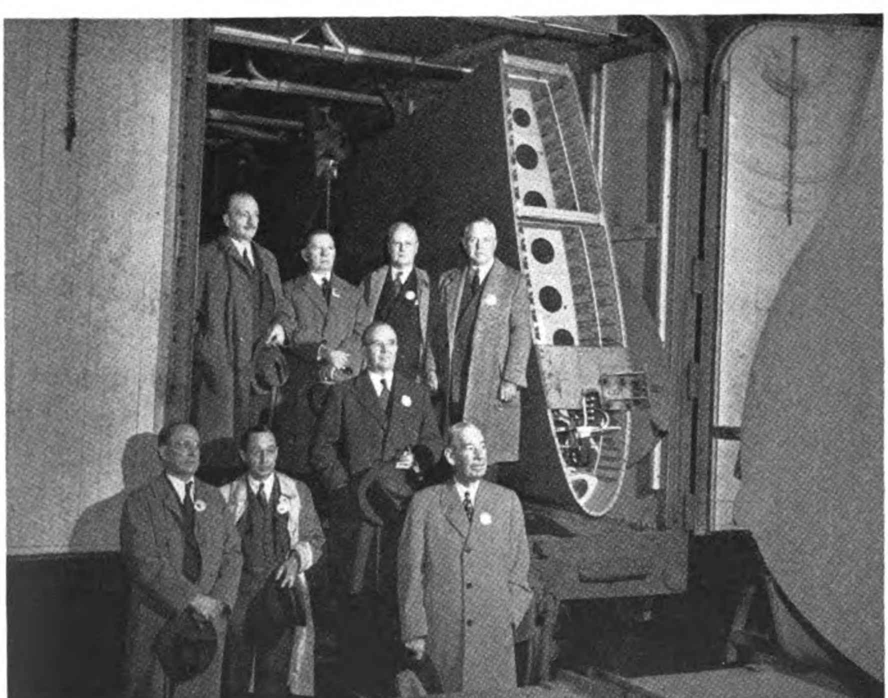
The functions of the new committee, the announcement indicates, are to keep the War Manpower Commission informed on the scope of the war supply program and its effect on labor requirements, to make recommendations as to the relative importance of industries as a basis for the establishment of labor priorities, and to consider from the standpoint of manpower facilities the feasibility of programs submitted to the office of program determination. When essential labor requirements cannot be met in any area, the announcement adds, a system of labor priorities will be administered by WPB through local labor requirements committees.

Union-Management Conference on Permanent Basis under ODT

A PERMANENT joint railway labor-management conference was organized under Office of Defense Transportation auspices on October 29, Director Eastman has announced. It will meet on the last Thursday preceding the last Friday of each month, unless Mr. Eastman calls a special meeting at another time.

Members of the railroad executives' committee, designated by the Association of American Railroads, are: M. W. Clement, president of the Pennsylvania; E. W. Scheer, president of the Reading; J. B. Hill, president of the Louisville & Nashville; E. E. Norris, president of the Southern; H. W. Baldwin, chief executive officer of the Missouri Pacific; and C. E.

(Continued on next left-hand page)



Directors of the Pullman-Standard Car Manufacturing Company watch the loading of aircraft wings into a box car for shipment—Left to right, Bottom row: H. M. Dudley, Wallace N. Barker, C. W. Seabury, R. L. Gordon. Top row: Ralph S. Euler, C. A. Liddle, president; C. W. Wright, and Huntley H. Gilbert

Denney, president of the Northern Pacific. The committee representing the railway labor organizations consists of the following: D. B. Robertson, president, Brotherhood of Locomotive Firemen and Enginemen; George M. Harrison, grand president, Brotherhood of Railway Clerks; S. J. Hogan, president, National Marine Engineers' Beneficial Association; B. M. Jewell, president, Railway Employees Department, American Federation of Labor; and A. F. Whitney, president, Brotherhood of Railroad Trainmen.

In addition to the six railroad executives and six labor representatives, it will include Otto S. Beyer and V. V. Boatner of the ODT, and Mr. Eastman will serve as chairman. The problem of railroad manpower and training was the first major topic considered by the conference at its first meeting held in November.

Supply Trade Notes

HARRY CRUMP has been appointed assistant to K. R. Beardslee, sales manager of the Carboloy Company, Inc., Detroit, Mich. Mr. Crump was formerly development engineer on carbide-tool applications and development at the central works laboratory of the General Electric Company at Schenectady, N. Y.

◆

HARRY W. RENICK has been appointed a vice-president of the Brake Shoe and Castings division of the American Brake Shoe & Foundry Co. Mr. Renick, who is also vice-president of Brake Shoe's Ramapo Ajax division, was born in Denver, Colo. He majored in civil engineering at Stanford University and after college was employed with the Union Pacific and the Colorado & Southern in engineering and construction work. In 1913 he joined the Elliot Frog & Switch Co., now a part of Ramapo Ajax, and three years later was sent to St. Louis, Mo., as sales manager. In 1926, Mr. Renick was instrumental in opening Ramapo's first plant on the west coast at Los Angeles, Cal., for the manufacture of railroad frogs, switches, and special trackwork. He was placed in charge of this plant and also, some time later, of a new plant at Seattle, Wash. When Ramapo Ajax became a Brake Shoe division, he was appointed vice-president in charge of the division's western plants at Los Angeles, Seattle and Pueblo, Ariz.

Harry W. Renick

◆

THOMAS C. WILSON, INC.—O. J. Bagnoli, vice-president and general manager of Thomas C. Wilson, Inc., manufacturers of tube cleaners and tube-cleaning accessories, announces the removal of the company's offices and plant to a new three-story reinforced concrete building at 21-11 Forty-Fourth avenue, Long Island City, N. Y. By this move floor space has been increased nearly four times and, should the need arise, additional stories can be added.

◆

W. E. GRIFFITHS, manager of the product development department of the Allegheny Ludlum Steel Corporation, has been appointed assistant manager of sales of flat rolled products.

◆

THE B. F. STURTEVANT COMPANY, Hyde Park, Boston, Mass., has opened a new branch plant at LaSalle, Ill., to serve as the company's mid-west production center, superseding the factory at Sturtevant, Wis., which was recently closed.

Obituary

JAMES B. STRONG, formerly president of the Ramapo Ajax Corporation (now the Ramapo Ajax division of the American Brake Shoe & Foundry Co.), died at Setauket, Long Island, N. Y., on November 10. He was 66 years of age.

◆

ALBERT E. CRONE, vice-president and general manager of the Buffalo Brake Beam Company at Lackawanna, N. Y., since 1922, died suddenly at his home in Buffalo, N. Y., on October 18, 1942. Mr. Crone was born in Newmarket, Ont., on February 27, 1872. He entered the service of the New York Central in 1892 and resigned in 1912 as storekeeper at Depew, N. Y., to enter the service of the Buffalo Brake Beam Company where he had since been employed as storekeeper, plant superintendent, and vice-president and general manager. He was a member of the Central Railroad Club of Buffalo.

◆

GEORGE M. VERITY, chairman of the American Rolling Mill Company, Middletown, Ohio, died in that city on November 6. Mr. Verity was born in East Liberty, Ohio, on April 22, 1865. In 1886 he became manager of the W. C. Standish Wholesale Grocery Company in Cincinnati, Ohio, and in 1889 entered the steel industry, taking over the management of the Sagendorf Iron Roofing and Corrugating Company in Cincinnati. In 1891 the company was reorganized as the American Steel Roofing Company and Mr. Verity was elected vice-president and general manager. While serving in these capacities Mr. Verity decided to organize a company to manufacture iron and steel sheets, and in 1899 the American Rolling Mill Company, Middletown, Ohio, was incorporated. At the first meeting of the board of directors on January 5, 1900, he was elected president and general manager. He continued as president until January 8, 1930, when he was elected chairman of the board.

George M. Verity

◆

EDMUND N. BOSWELL, manager of the Dunkirk, N. Y., plant of the American Locomotive Company since 1937, and an employee of that company for more than 44 years, died November 19. He was 60 years of age. Mr. Boswell joined the American Locomotive Company in 1898 as a machinist at the Richmond, Va., plant, which was then known as the Richmond Locomotive Works. During the World War, he served the company at Paterson, N. J. When the Paterson plant was closed in 1926, he was transferred to the New York offices. In January, 1937, he went to Montreal, Canada, as manager, and on December 1 of that year was transferred to Dunkirk.

Army-Navy "E" Awards

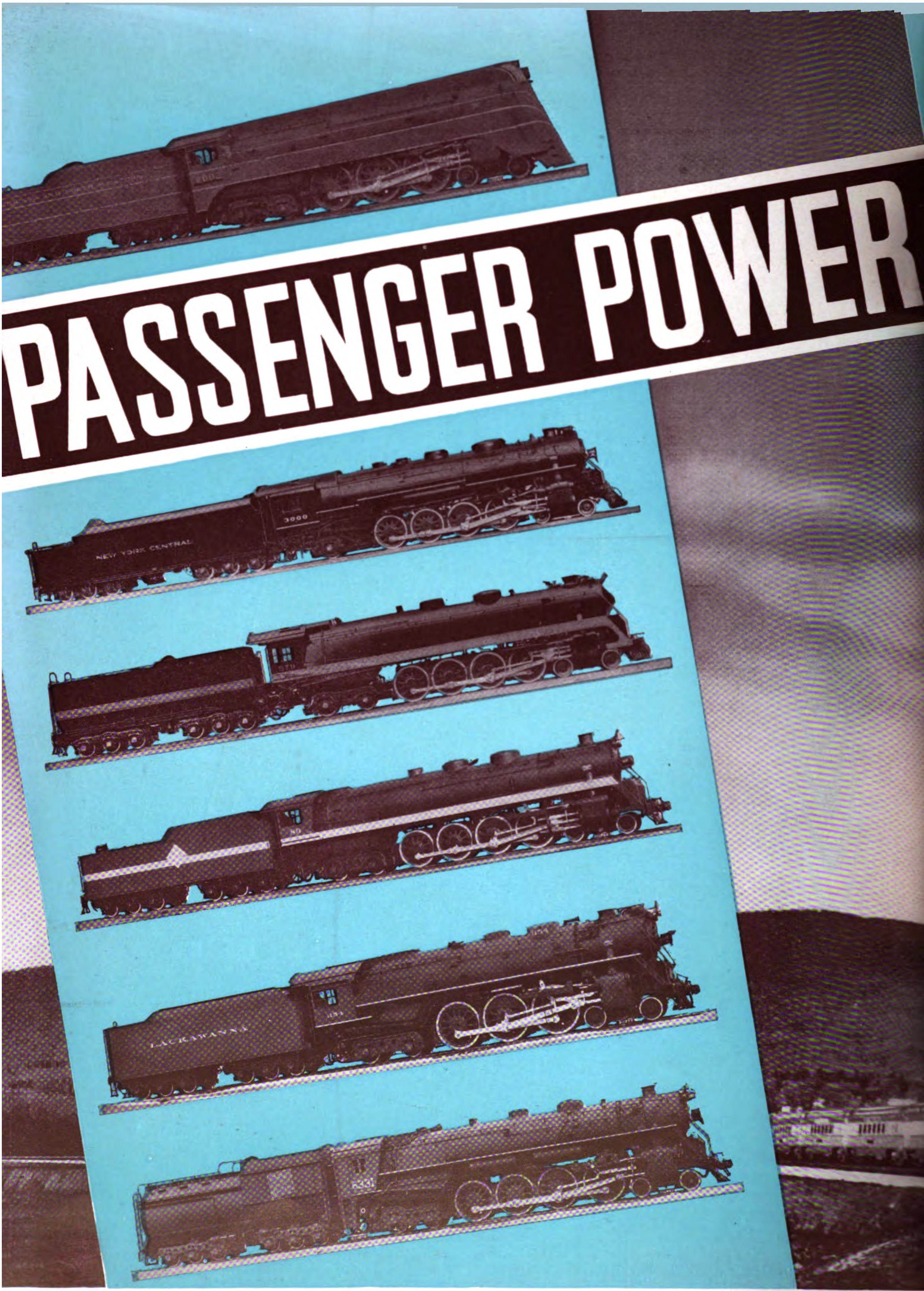
American Forge Division of the American Brake Shoe & Foundry Company. October 24.

American Welding Company, subsidiary American Car and Foundry Company, Carbondale, Pa. November 10.

Armstrong Cork Company, Lancaster, Pa. Floor division and Closure plants. November 30.

(*Turn to third right-hand page*)


CANADIAN
HIGH-SPEED PASSENGER POWER
CANADIAN PACIFIC
2862
THE CANADIAN PACIFIC STANDARD 4-6-4 high-speed passenger locomotive.
6205
THE CANADIAN NATIONAL STANDARD 4-8-4 high-speed passenger locomotive for heavy duty service.
6400
THE CANADIAN NATIONAL 4-8-4 locomotive of the "6400" Class are some of the largest locomotives in the British Empire and are operating very successfully in heavy fast passenger service.
MONTREAL LOCOMOTIVE WORKS · LIMITED
MONTREAL · · · · · · CANADA


PASSENGER POWER
NEW YORK CENTRAL
3000
LACKAWANNA
AMERICAN LOCOMOTIVE COMPANY


with Speed and Dependability
...VITAL TO THE WAR EFFORT
UNION PACIFIC
825
Right now the railroads are handling the heaviest passenger traffic on record—up 65 per cent in June over the like month last year. Powerful steam locomotives of proven design are in large measure responsible for this excellent showing. Dependable modern steam locomotives Keep 'em Rolling.
Alco
Empire State Express
NEW YORK CENTRAL SYSTEM
30 CHURCH STREET · NEW YORK · N.Y.

Personal Mention

General

D. V. Gonder, locomotive foreman of the Canadian National at Turcot, Que., has been appointed superintendent of motive-power and car shops at Montreal, Que.

W. Q. Daugherty, master mechanic of the Gulf, Mobile & Ohio at Jackson, Tenn., has been appointed assistant superintendent of motive power and car equipment, with headquarters at Jackson.

E. S. McCracken, superintendent of the Canadian Pacific at Medicine Hat, Alta., has been promoted to general superintendent of the Algoma district, with headquarters at North Bay, Ont. Mr. McCracken entered the service of the C. P. R. in 1910 as a fireman at Medicine Hat, Alta. Previous to that time, he was a machinist on the Intercolonial Railway in New Brunswick. In 1917 he became an engineer at Medicine Hat and two years later road foreman of engines. In 1921 he was transferred to Lethbridge, Alta., as master mechanic, and in 1926 he became assistant superintendent at Calgary. He was transferred to Lethbridge in 1929 and in 1934 he was appointed superintendent at North Bend, B. C. In 1936 Mr. McCracken was transferred as superintendent to Nelson, B. C. and later served successively as superintendent at Revelstoke, B. C., and Medicine Hat.

E. S. McCracken

Master Mechanics and Road Foremen

R. R. Sneddon, assistant master mechanic of the New York Central (Michigan Central) at West Detroit, Mich., has been appointed master mechanic, with headquarters at Jackson, Mich.

H. E. Anderson, assistant division master mechanic of the Atchison, Topeka & Santa Fe at La Junta, Colo., has been appointed to the newly created position of master mechanic of the Western division, with headquarters at Dodge City, Kan.

James J. Ryan, general foreman of the Chicago, Rock Island & Pacific at Armourdale (Kansas City), Kan., has been appointed to master mechanic of the Arkansas division, with headquarters at Little Rock, Ark.

W. G. Ringland, assistant master mechanic of the New York Central, has been appointed master mechanic, in charge of the motive power and car department, Pennsylvania division, with headquarters as before at Avis, Pa. The positions of division general car foreman and assistant master mechanic at Avis have been abolished.

Car Department

A. P. Gilsdorf, car foreman of the Norfolk & Western at Lambert Point, Va., has been promoted to the position of general car inspector, at Roanoke, Va.

Walter C. Kresge, a special apprentice in the employ of the Lehigh Valley at Sayre, Pa., has been promoted to the position of general car foreman at Sayre.

Shop and Enginehouse

F. A. Baldinger, district master mechanic of the Baltimore & Ohio at Baltimore, Md., has been appointed general supervisor of locomotive maintenance with the same headquarters.

A. H. Adang, who has been appointed superintendent of shops of the New York, Chicago & St. Louis at Conneaut, Ohio, as announced in the September issue, was born on September 23, 1901, at Portland, Jay County, Ind. He is a graduate of a country school in Portland (1915). In October 9, 1916, he entered railway service as a machinist apprentice in the employ of the Pennsylvania at Ft. Wayne, Ind., and was a machinist on that road from 1920 to 1924. On October 13, 1924, he became a machinist on the New York, Chicago & St. Louis and in June, 1936, was promoted to the position of assistant enginehouse foreman. He became general foreman of the locomotive shops at Conneaut in February, 1942, and on June 16, 1942, was appointed superintendent of shops.

A. H. Adang

Obituary

F. N. Hayes, master mechanic of the Virginian at Elmore, W. Va., died on November 13, at Mullens, W. Va.

Timothy B. Roberts, supervisor of apprentices of the Lehigh Valley, died after a short illness on October 14, 1942, at the age of 56 years. Mr. Roberts was born in Wellsboro, Pa. Mr. Roberts entered the service of the Lehigh Valley as a call boy at the age of 14. He became a machinist apprentice at Sayre in 1905, and after his apprenticeship was employed in the Sayre shops as a machinist for 11 years. In June, 1918, he became a foreman and in August, 1924, a piecework inspector, continuing as such until February, 1930, when he became supervisor of apprentices.

Edwin W. Norris, master mechanic of the Frankfort & Cincinnati, with headquarters at Frankfort, Ky., died of a heart ailment at a hospital in that city on October 25.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

Valve Repairs.—Crane Co., 836 South Michigan avenue, Chicago. Bulletin No. 5, "How to Repair Valves," explains and illustrates various steps in repairing leaky gate and globe valves. Hints on how to reclaim discarded valves.

◆

Universal Slotmaster.—Experimental Tool & Die Co., 12605 Greiner avenue, Detroit, Mich. Four-page illustrated bulletin describes the Universal Slotmaster and six different set-ups on the machine.

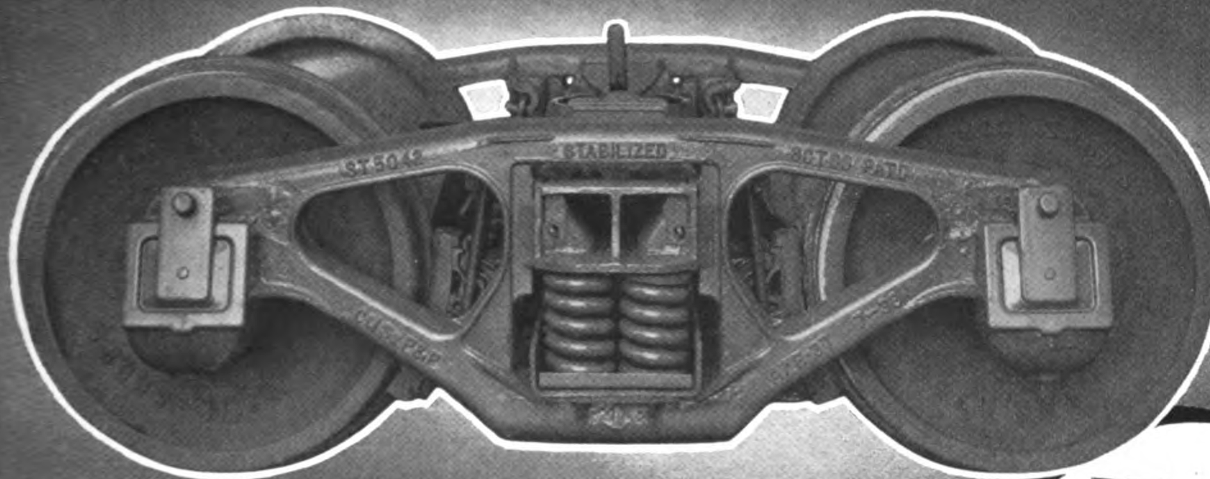
◆

"Oiling the Lathe."—South Bend Lathe Works, South Bend, Ind. Nineteen-page illustrated Bulletin H-2, the second of a series on lathe service, emphasizes the importance of proper lathe lubrication in maintaining maximum performance and accuracy and outlines a regular procedure of oiling with proper lubricants at definite intervals.

◆

"Stellite" Tools.—Haynes Stellite Company, Unit of Union Carbide and Carbon Corporation, 30 East Forty-second street, New York. Form 5783—"Stellite 98M2 Metal-Cutting Tools for Machining Steel"—lists the sizes and prices of 84 standard square and rectangular tool bits and 74 varieties of welded-tip tools, all made of 98M2, a non-ferrous cutting-tool material. Recommendations regarding grinding wheels for use on tools of this alloy also presented for several types of hand- and machine-grinding operations.

More Important Now
THAN EVER BEFORE



BARBER

STABILIZE YOUR TRUCKS

Designed for use with or without spring planks—also with or without lateral motion.

Railroad executives don't have to be told about the absolute necessity these days of conserving cars and the protection of lading against the countless shocks and bumps caused by continually increasing speeds.

That is why today, more than ever before, railroad officials realize that BARBER Stabilized Trucks safeguard and conserve not only cars and ladings, but rails and road bed as well.

For, in BARBER Stabilized Trucks, the wear which usually takes place between the bolsters and columns in ordinary trucks, has actually been put to work to break up the bouncing action of the springs and, therefore, effectively controls destructive harmonic bouncing and materially reduces damage to cars and ladings and maintenance expense.

Over 58,000 *Cars with Stabilized Parts Now in Service.*

Specify Barber Stabilized Trucks and Keep Shippers Satisfied

Representatives

Mr. Ivan L. Ward, 503 Market Street, San Francisco

Mr. George G. Prest, E-906 First National Bank Building, St. Paul, Minnesota

Miller-Lewis Railroad Equipment Corporation, 80-82 Reade Street, New York, N. Y.

T. C. Coleman and Son, Heyburn Building, Louisville

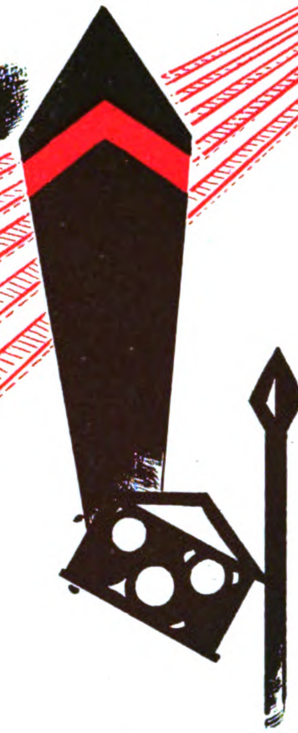
Dudley A. Bonitz, 412 Kingsbury Street, Oxford, N. C.

STANDARD CAR TRUCK COMPANY

332 SOUTH MICHIGAN AVENUE CHICAGO, ILLINOIS

INDEX TO ADVERTISERS
DECEMBER, 1942

5 CLEAR TRACKS TO WARTIME MAINTENANCE ECONOMIES



1 Preparing locomotive frames, wheels and other large parts for fracture tests

2 Washing engine jackets, cabs, tenders

3 De-scaling Diesel cooling systems, oil coolers, injectors, feedwater heaters

4 Pressure cleaning valve gear, trucks, etc.

5 Reclaiming and reconditioning triple-valve and other rubber gaskets

Why is Maintenance Performed the TIME-SAVING Oakite Way Assuming NEW Significance and Importance?

It is because specialized, FAST-WORKING Oakite materials are effectively helping Mechanical Supervisors turn out MORE WORK in LESS TIME... helping them conserve precious man-hours so that motive power and rolling stock are returned to service FASTER. That is why, on these FIVE major jobs as well as those listed in panel at right, you will find Oakite degreasing and cleaning materials are being used as APPROVED and STANDARD practice by many Class I and Class II roads. Let our Railway Service Division serve your road, too, in the same helpful way! Your inquiry invited and promptly answered.

OAKITE PRODUCTS, INC., Room 1002, Wrigley Building, Chicago, Ill.

In Canada: OAKITE PRODUCTS OF CANADA, LTD.

TORONTO: 65 Front St. East—MONTREAL: 1 Van Horne Ave.

OAKITE

TRADE MARK REG. U.S. PAT. OFF.

RAILWAY SERVICE DIVISION

"KEEP POWER ROLLING"

Mechanical Engineers and Other Maintenance Men

should have detailed data on performance-proved Oakite materials and methods specially designed to help conserve man-power, save time, improve results and reduce costs on such work as . . .

Back Shop Tank Cleaning
•
Cleaning Crossheads, Bearings, Journal Boxes, Brake Shoes, Etc.
•
Cleaning Air Compressors
•
Stripping Paint from Tenders, Freight Cars, Passenger Coaches
•
Cleaning Tank Car Interiors
•
Cleaning and Deodorizing Freight and Refrigerator Cars
•
Safely Washing Streamliners
•
Cleaning Diesel Cylinder Heads Liners, Pistons, etc.
•
Interior Coach Washing


Buy
MORE
War
Bonds

HIGH-IRON THROUGH IRAN

On a desert in Southern Iran (formerly Persia) so hot that 100 degrees is considered temperate, railroad men from Altoona, Chicago, St. Louis, and Schenectady are hustling around new workshops where American-made locomotives and rolling stock are being shaped up for service on the Trans-Iranian Railway.

Rubbing shoulders with these grimy Yankees are bearded Sikhs, blond Russians, British railroaders from Crewe and Swindon, dark-skinned Armenian and Persian mechanics and drivers. They mingle and mill in a Hollywood boom town half way around the world from our picture capital. Their business is to move desperately needed defense material through Iran into Russia.

The Russian railroad from Arctic Murmansk is one of the life lines for Northern Russia. But the Trans-Iranian Railway has become the more important life line for Southern Russia. Hence, American railroaders, after doing magnificent jobs in their own country, have been sent to Iran. They are working alongside British railroaders, helping to keep the line open and active.

After the Shah of Persia had spent $160,000,000 of his subjects' money on his Trans-Iranian—in 1938—he proudly boasted that it ran "from nowhere to nowhere" across his desolate but oil-bearing country from the Persian Gulf almost to the inland Caspian Sea. As he wanted no help from Soviet Russia or Britain, his north-and-south railway was built to block Russian or British economic penetration.

When British and Russians deposed the Persian tyrant—in 1940—the Trans-Iranian had only two locomotives, rails that were falling apart, and almost no sidings for two-way traffic on 960 miles of "isolationist" tracks. A small group of British engineers began putting this rickety railroad into operating condition. Gradually hundreds of American railroaders joined them.

They laid 75 miles of new steel across tough plateaus and deserts and through gorges connecting the "nowhere to nowhere" Trans-Iranian with a Caspian port of embarkation for Southeastern Russia. They have also extended the Shah's original line across the Baluchistan border, heading toward India.

Since the Allies officially occupied Iran—last year—United States and British engineers have turned blueprints into vast jetties, sheds, and workshops. They have installed modern equipment, have put thousands of experienced maintenance and operating railroaders in charge of the right of way. American locomotives are sharing the high-iron of Iran with their British cousins, hauling three times the volume of defense supplies to Russia that Iran's railroads carried a year ago.

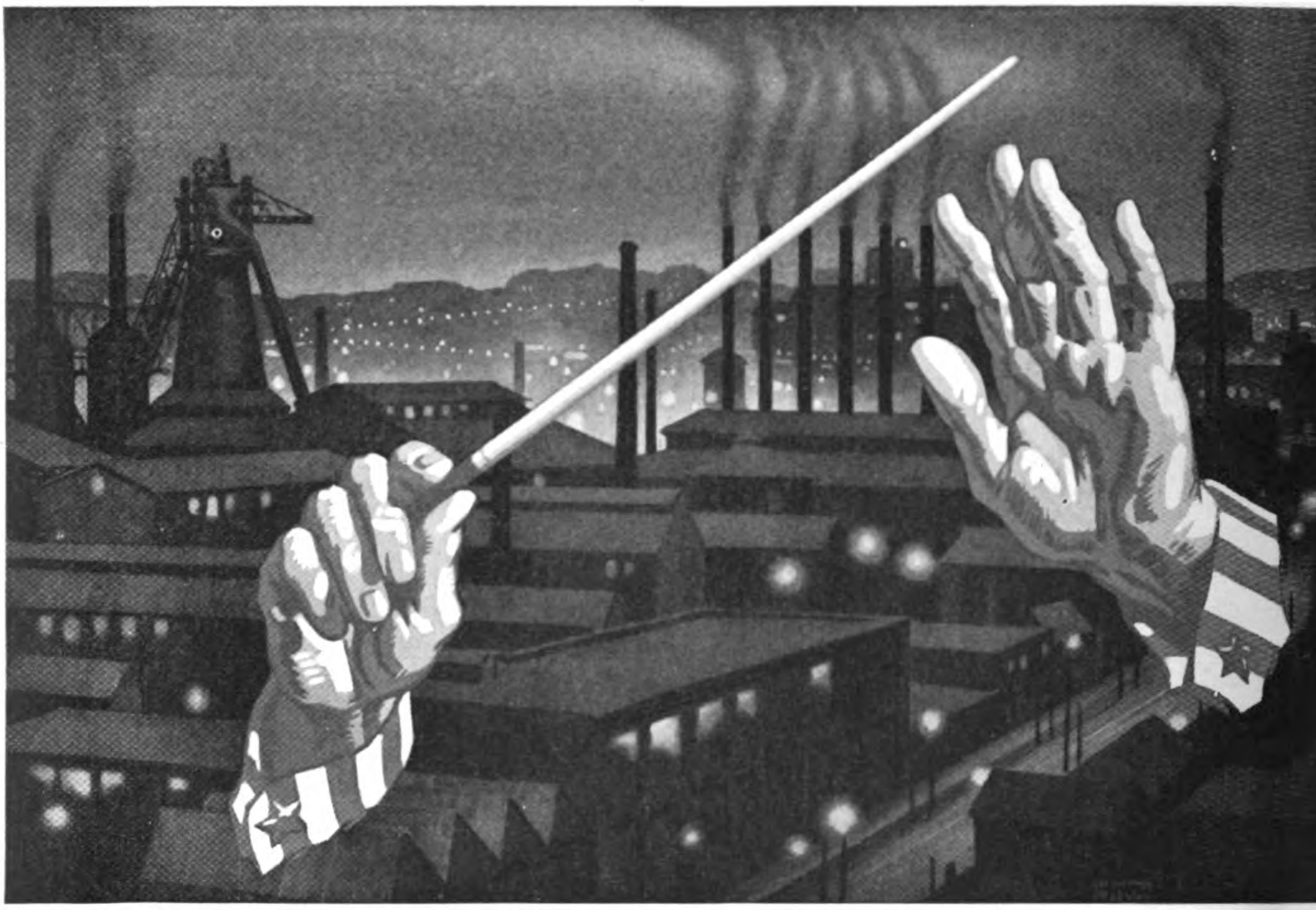
American railroaders are getting set to do similar jobs—building and operating—on the new line to Alaska and new lines to other places. Some of these fighting-front fellows did their transportation bits in Europe during the first World War. During this World War they are going farther and doing the job better.

In Iran they are battling night and day in the cause of beleaguered Russia. They may have to build a long rail line around the eastern shore of the Caspian to get the vital supplies through. But if anyone can do it, those American railroaders can.

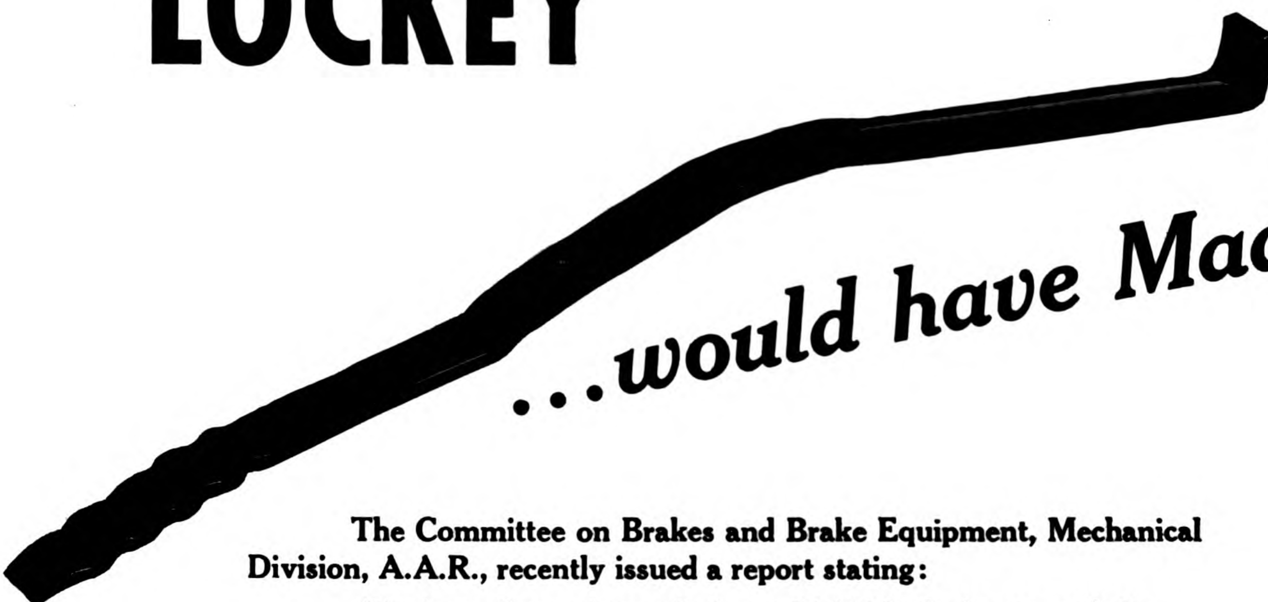
—*The Trackwalker*

AMERICAN LOCOMOTIVE ● GENERAL ELECTRIC

114-22-9600



A Brake Shoe
LOCKEY



. . . would have Made

The Committee on Brakes and Brake Equipment, Mechanical Division, A.A.R., recently issued a report stating:

> **"An inspection and record of over 34,000 brake beams made by the members of the Committee on Brakes and Brake Equipment indicated that approximately 50% of all brake beam removals are due to worn heads. The worn head condition is a direct result of relative motion between the brake shoe and brake head. The better the brake shoe fits the head, the less this relative movement will be and consequently will minimize the wear."**

Motion between the brake head and brake shoe in freight car operation is minimized by the Brake Shoe Lockey. It holds the shoe and head tightly together. It also prevents loss of shoes and keys while on car dumpers or by chattering brakes.

The Lockey, made of alloy spring steel, specially heat treated, will not take a permanent set and can be used many times.

Use the Brake Shoe Lockey in all your freight equipment and reduce brake beam removals to a minimum.

THE AMERICAN BRAKE SHOE

S-P-E-E-D . . . with power and sureness and *safety* . . . Snap-on heavy-duty sockets are stand-outs in spots like this! So snug the fit, so secure the grip, that leverage can be applied quickly, solidly, *confidently.*

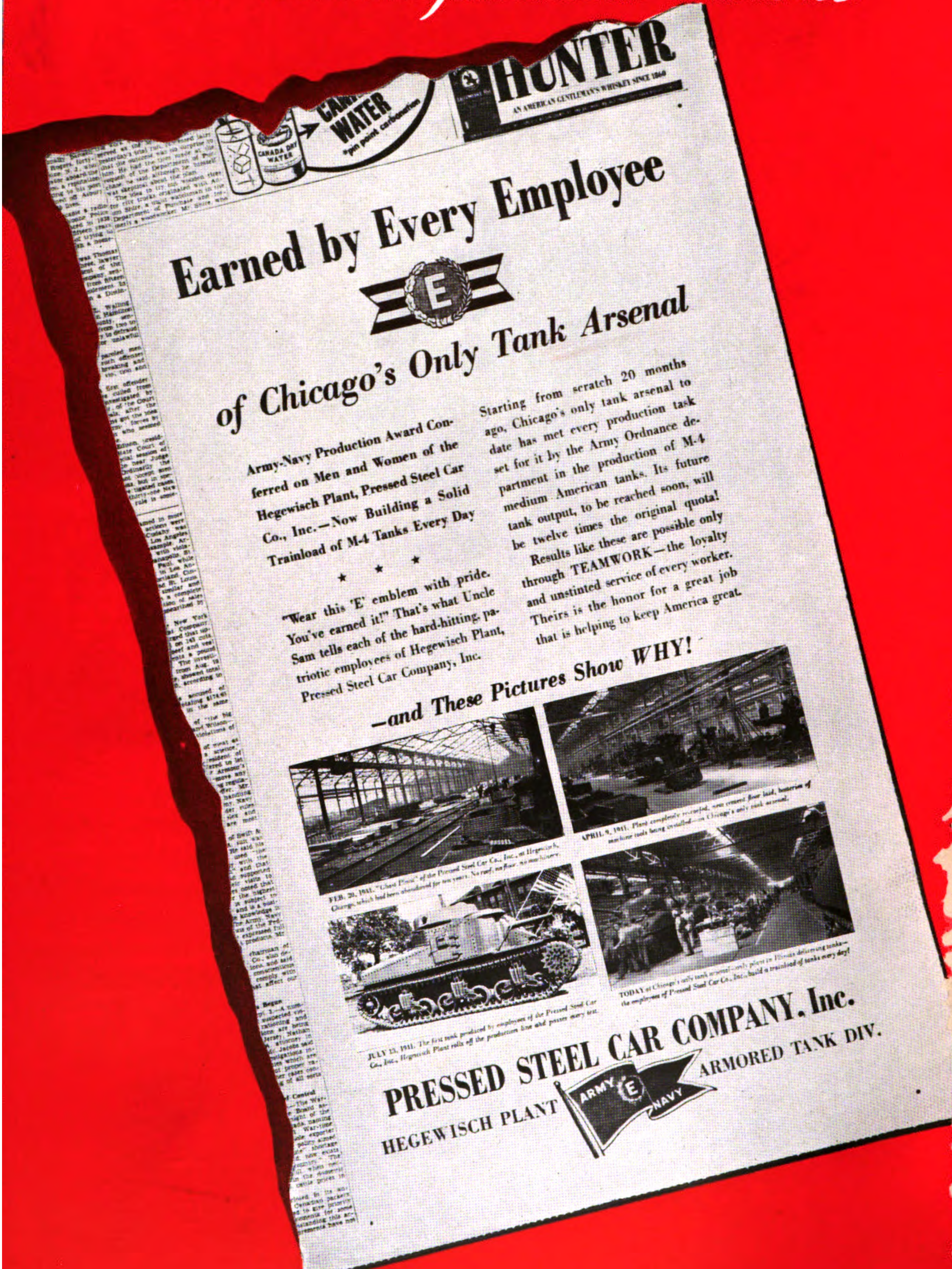
Accompanying America's inexorable speed-up for Victory, accident ratios are mounting precipitately . . . are today the most critical slow-down faced by industry. For every requirement of high production and efficient maintenance, the need for speed *with safety* is squarely answered with Snap-on tools. 3000 Snap-on hand and power tools are everywhere available through 35 factory branches located in principal cities.

10%

INVESTING FOR VICTORY!
The employees of Snap-on Tools Corporation are enrolled in the Treasury's 10% payroll deduction plan.

SNAP-ON TOOLS CORPORATION
8044-L 28th Avenue, Kenosha, Wis.

A distinguished award



PRESSED STEEL CAR COMPANY, INCORPORATE

Waste Warden Tells

HOW TO GET LONGER SERVICE

from your Welding and Cutting Apparatus

TORCHES

1. Blow out hose before attaching torch.
2. Be sure the torch seat is clean.
3. Be sure packing nut is tight.
4. Also—don't use torch as a hammer. A torch built to withstand such abuse would be too heavy to handle.

TIPS

1. Clean tips with proper size standard cleaning drills only. Be sure to use a drill one size smaller than the orifice about to be cleaned. Makeshift wire cleaners enlarge tip openings and upset flame balance.
2. Store all tips in racks to prevent damage. Tips battered at seating end waste gas.

REGULATORS

1. Keep regulator seat dust free. Before attaching regulator clean outlet by cracking cylinder; clean gland by a short blast from cylinder.
2. Release regulator adjusting screw when changing cylinders. This prevents high pressure shocks to regulator seat.
3. Always open cylinder valve slowly when installing regulator. Repeated sudden cracking of cylinder into regulator promotes leakage.

DON'T JUNK DAMAGED APPARATUS

Today regulators, torches and tips are hard to replace. Good maintenance practices will help you get longer service and better performance from your gas welding and cutting apparatus.

If a torch, tip or regulator is damaged, don't junk it—have it repaired promptly.

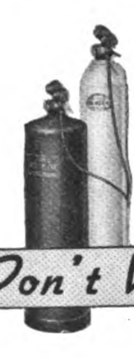
AIR REDUCTION

60 EAST 42nd STREET, NEW YORK, N. Y.

IN TEXAS: MAGNOLIA-AIRCO GAS PRODUCTS COMPANY

AIRCO

WILSON



OXYGEN IS PRODUCTION — *Don't Waste it!*

70-137

ARMY AIR CENTER
MATERIEL CENTER SUPERVISOR
OFFICE OF THE DISTRICT DISTRICT
CENTRAL PROCUREMENT DISTRICT
8505 W. WARREN AVE.
DETROIT, MICH.

July 13, 1942

PRODUCTION SECTION
CENTRAL PROCUREMENT DISTRICT
MANUFACTURERS' LETTER NO. 10
CHICAGO AREA OFFICE

SUBJECT: Cemented Tungsten Carbide for Cutting Tools

1. The following is quoted from memorandum, dated June 19, 1942, from the War Department, Headquarters. Services of Supply, Washington, D.C.:

"In the interest of conservation of critical alloys and of increased production, attention is directed to the following stated advantages of cemented tungsten carbide tools . . .

"a. One pound of tungsten in the form of cemented tungsten carbide for cutting tools will do the work of 70 to 100 pounds of tungsten in high speed tool steel. Furthermore, its use eliminates substantial amounts of chromium and vanadium which are considered necessary components of practically all high speed tool steel.

"b. Cemented tungsten carbide functions satisfactorily on almost all types of lathes and boring machines, particularly those of the sturdier construction. This is said to include all such machine tools manufactured in the last five years.

"c. Cemented tungsten carbide works efficiently on all steels above approximately .30 carbon and is effective up to 500 brinell or more.

"d. Cemented tungsten carbide will give two or three times the production of high speed tool steel in those operations to which its use is adapted and over a given run will require about one-fifth the number of grinds that standard high speed tool steel will require."

2. This information is forwarded by direction, Wright Field letter, EAZ-ar-72-2, (July 3, 1942).

3. Any requests for further information should be directed to the AAF Chicago Area Office, 20 N. Wacker Drive, Chicago, Illinois, Attention: Production Section.

For the District Supervisor:

HARLEY S. JONES
Lt. Colonel, Army Air Forces
Technical Executive

CENTRAL AIR CORPS PROCUREMENT DIST. OFFICIAL WAR DEPT. DETROIT, MICH.

Distribution: 1-5 ... in CPD

NOTE: In the reproduction of the above letter by Firth-Sterling, it is to be understood that it does not imply the WAR DEPARTMENT'S indorsement of any company's products.

FIRTHITE

TUNGSTEN - TITANIUM CARBIDES

FOR STEEL CUTTING

FIRTHITE **T-04*** Universal grade for heavy duty, interrupted cuts, and coarse feeds, on older machines.

FIRTHITE **TA*** General-purpose grade for cutting steels under "average" conditions.

FIRTHITE **T-16*** **The** grade for fine, extremely fast machining of steel.

FIRTHITE **T-31*** Hardest, wear-resistant, premium grade for precision boring, etc.

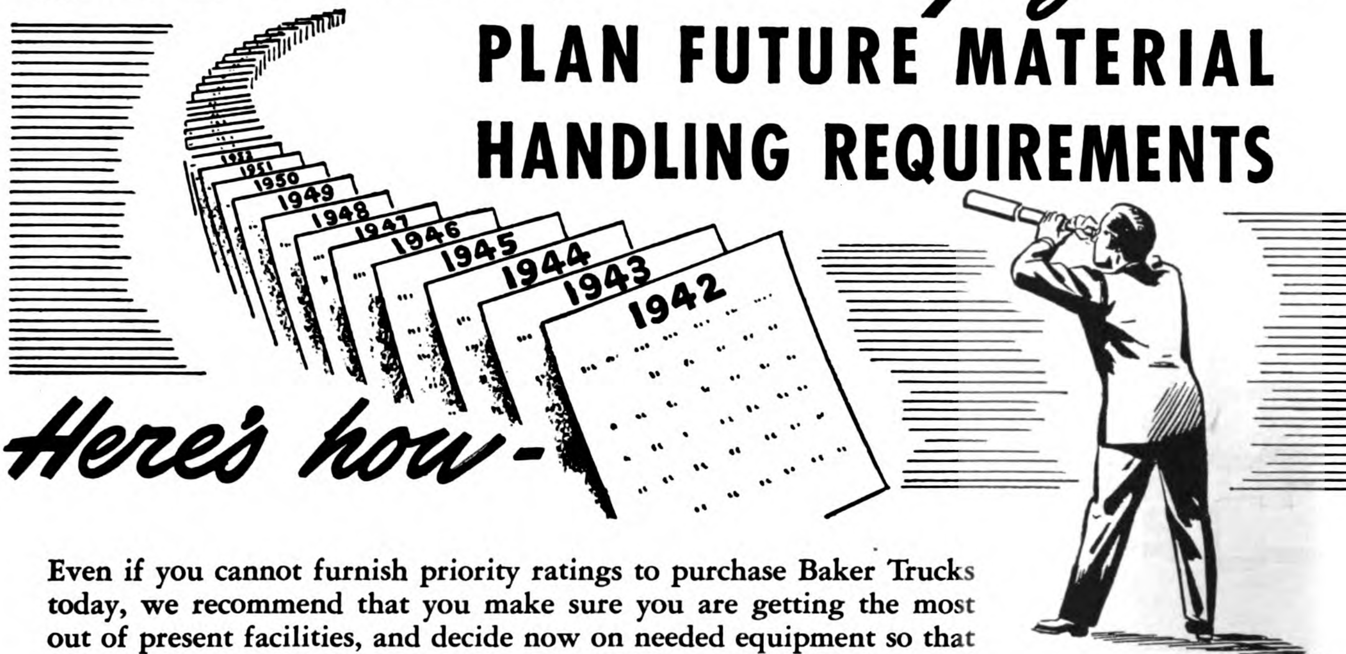
* **TITANIUM** in these FIRTHITE grades makes possible better, faster, cheaper cutting of steel and at the same time permits tool prices comparable with those for high-speed steel. These FIRTHITE grades are made under one or more of the following patents on **TITANIUM** Carbides: 1,925,910; 2,023,413; 2,246,387; 2,265,010; Re. 22,073; Re. 22,074; Re. 22,166; Re. 22,207.

Firth-Sterling
STEEL COMPANY

Offices: McKEESPORT, PA. · NEW YORK · HARTFORD · PHILADELPHIA · CLEVELAND · DAYTON · DETROIT · CHICAGO · LOS ANGELES

BAKER *can help you to*

PLAN FUTURE MATERIAL HANDLING REQUIREMENTS



Here's how—

Even if you cannot furnish priority ratings to purchase Baker Trucks today, we recommend that you make sure you are getting the most out of present facilities, and decide now on needed equipment so that you will be first in line when trucks become available. A material handling survey will answer these questions:

1. ARE PRESENT FACILITIES ADEQUATE?
A study of operations will indicate what new equipment is needed today or in the future.

2. IS PRESENT EQUIPMENT USED TO BEST ADVANTAGE?
Make sure your trucks, cranes and conveyors are in first class running order. See that equipment is used where most needed, and that it has as little idle time as possible.

3. IS EQUIPMENT SUITED TO THE JOB?
Determine changes needed to bring top efficiency. Interchanging some of your own trucks may be advisable, if they are not handling jobs for which intended. Future changes to other types might be indicated.

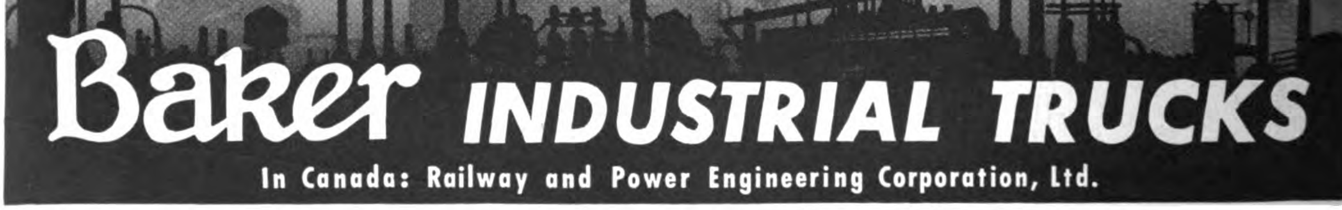
4. IS "UNIT PACKAGE" SYSTEM EMPLOYED?
Efficiency of power trucks is greatly increased by the use of skids, tote boxes and pallets. Are you using them to fullest advantage?

5. ARE SUPPLIERS SHIPPING MATERIALS SO THAT YOU CAN HANDLE THEM EFFICIENTLY?
If not, suggest that they use skids, pallets or package units that can be unloaded efficiently with your power trucks.

THE BAKER MATERIAL HANDLING ENGINEER CAN HELP YOU

He will be glad to go over your entire handling problem with you. His recommendations can save you time and money. He is at your service.

BAKER INDUSTRIAL TRUCK DIVISION
of the Baker Raulang Company
2172 West 25th Street • Cleveland, Ohio



HERE IS *Mileage*!

IN this husky 1¼″ rim of the U·S·S One-Wear Wrought Steel Wheel are at least 200,000 miles of fast, safe freight service under normal conditions. Some of these wheels have run 410,962 miles. Many of them have gone well over the 300,000 mile mark before reaching the condemning limit. No other freight car wheel costs so little to run. No other wheel assures comparable safety both to load and rolling stock, is so free from risk of sudden failure, or resists the development of skid flats and brake burns so stubbornly.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

UNITED STATES STEEL

DIESELS

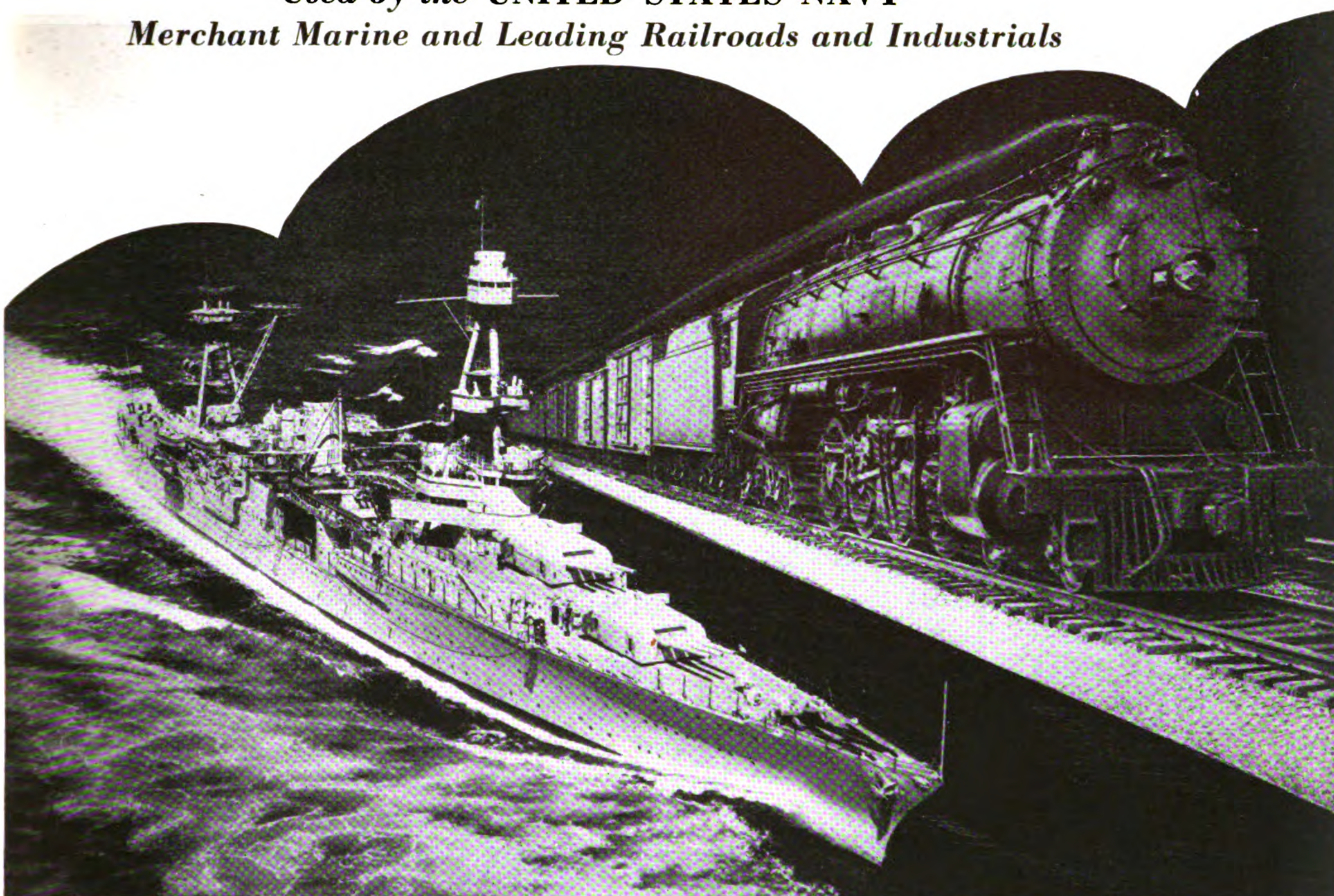
Baldwin 660-hp. diesel-electric switching locomotive for the Chicago and Eastern Illinois. De La Vergne 6-cylinder, 4-cycle diesel engine. Westinghouse electrical transmission equipment.

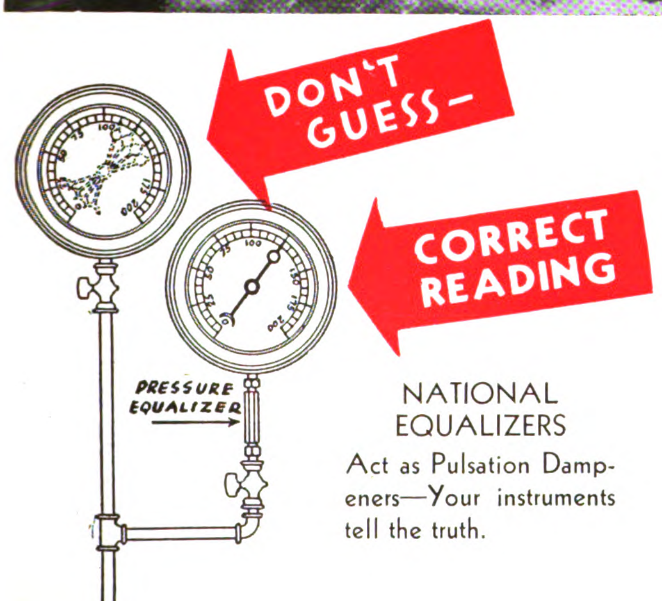
BLW THE BALDWIN GROUP

THE
BALDWIN
LOCOMOTIVE WORKS
Philadelphia

NATIONAL GAUGE PRESSURE EQUALIZER

Used by the **UNITED STATES NAVY**
Merchant Marine and Leading Railroads and Industrials





NATIONAL EQUALIZERS

Act as Pulsation Dampeners—Your instruments tell the truth.

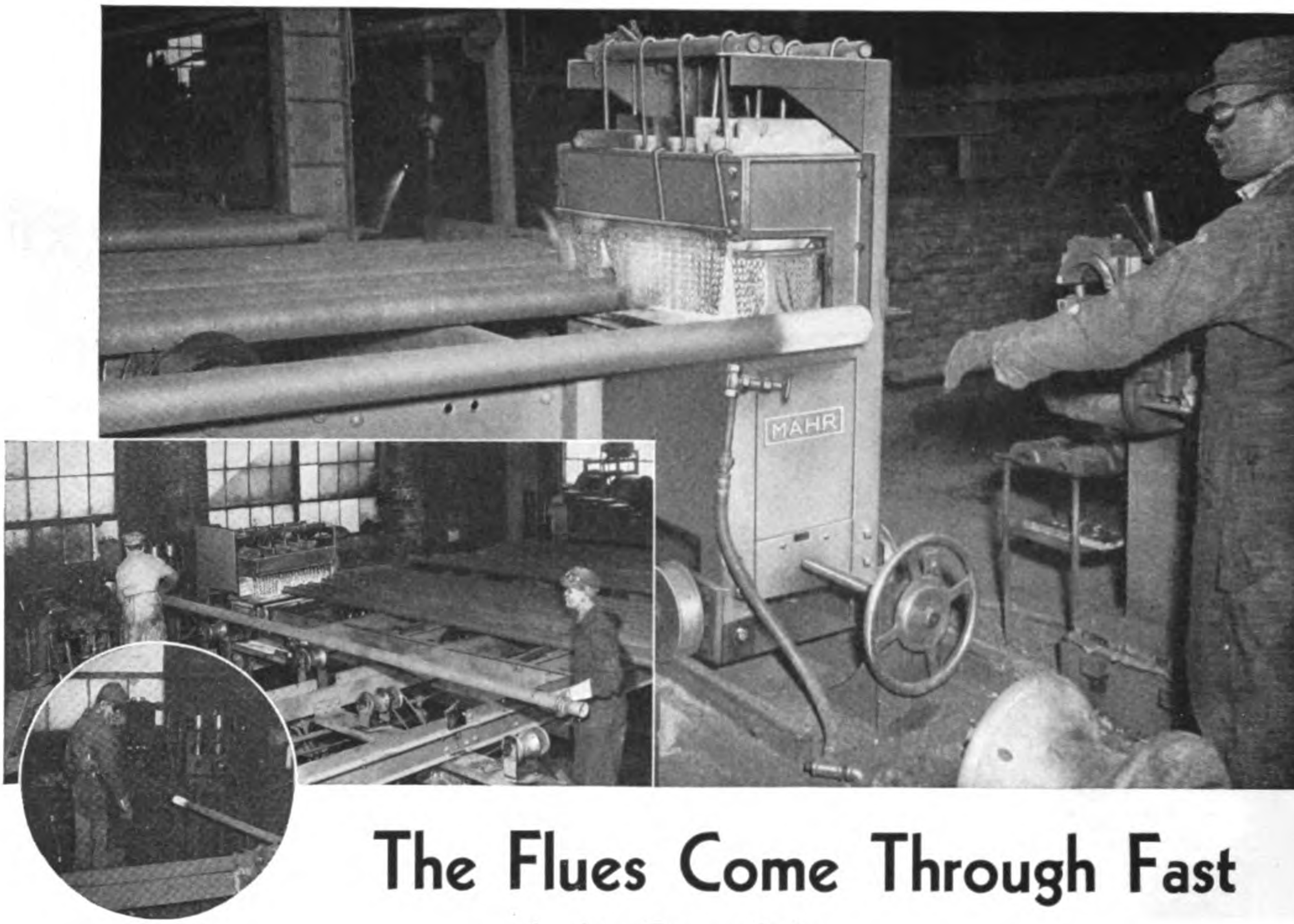
PROTECTS YOUR GAUGES AND RECORDING INSTRUMENTS FROM HAMMER AND DAMAGE CAUSED BY SURGING, PULSATING PRESSURES

CHARACTERISTICS AND ADVANTAGES

1. Increases life of instrument.
2. Two parts its entire construction.
3. Same Equalizer used on 5 lbs. or on 50,000 lbs. pressures.
4. Can be transferred to any service without adjustment.
5. NO VALVE STEMS TO BEND.
6. NO DIAPHRAGMS TO REPLACE.
7. NO WORN OUT RUBBER SACS.
8. WILL NOT CLOG. LAST INDEFINITELY.
9. Its merit recognized by leading instrument and gauge manufacturers.
10. MADE FOR ALL CONDITIONS AND PRESSURES

NATIONAL ENGINEERING PRODUCTS, INC.
COMMERCE & SAVINGS BUILDING WASHINGTON, D. C.
Representatives in Principal Cities of United States

Represented in Dominion of Canada by Canadian General Electric Company, Inc.



The Flues Come Through Fast

with this Open Side

MAHR *Special R.R. Type* FURNACE

Here's a splendid example of how the reconditioning of flues can be speeded up, when you have equipment specially designed for the job by heat treating specialists, and engineered to keep a non-stop, progressive, continuous production line.

With a MAHR Open Side Special R.R. Type Furnace, the heated flues are always ready for the swager as fast as he can take them. The flues roll in—are properly heated—and out! The chain curtain permits free rolling and yet maintains a surprisingly efficient closure during the heating period.

This MAHR R.R. Type Flue Furnace is designed to handle flues up to 5⅜″ O.D., #8 gauge. It is constructed with a substantial steel framework and heavy steel plate shell. Chamber opening is framed in heavy cast iron sections to give added strength and resistance to heat at this point. Combustion chamber walls are of high quality firebrick and insulated.

A special feature is the suspended type arch. Standard arch shapes suspended from upper framework can be easily replaced when burned out under service and any section of that arch can be replaced without disturbing the rest of the arch. This repair can be handled by unskilled labor when bricklayers are not readily available.

Either oil or gas burners can be supplied. For swaging, at operating temperatures of 1750 to 1800° F., a furnace of 27″ x 9″ x 7½″ rated size is used and for annealing at 1400 to 1500° F., a furnace of 18″ x 6″ x 7½″ rated size is used. Many railroad shops know how well this rugged MAHR unit stays on the job and turns out the work.

Ask for complete information on the MAHR Open Side Special R.R. Type Furnace, or other types as listed for ANY heat treating process. MAHR makes 'em all!—backed by a 25 year record of successful achievement.

MAHR
ENGINEERS • DESIGNERS • MANUFACTURERS
ALL EQUIPMENT FOR METAL HEATING

Other MAHR Products for Railroads:

Stress Relief Furnaces	Locomotive Fire Lighter	Crucible Furnaces
Hand Torches	Locomotive Tire Heater	Tool Furnaces
Preheating Torches	Rivet Forges	Oil and Gas Burners
Paint Burning Torches	Forging Furnaces	Low Pressure Blowers
		Valves
		Ladle Heaters

Babbitt Furnaces—Pot, Portable, Stationary

★ *Save ALL your scrap!* ★

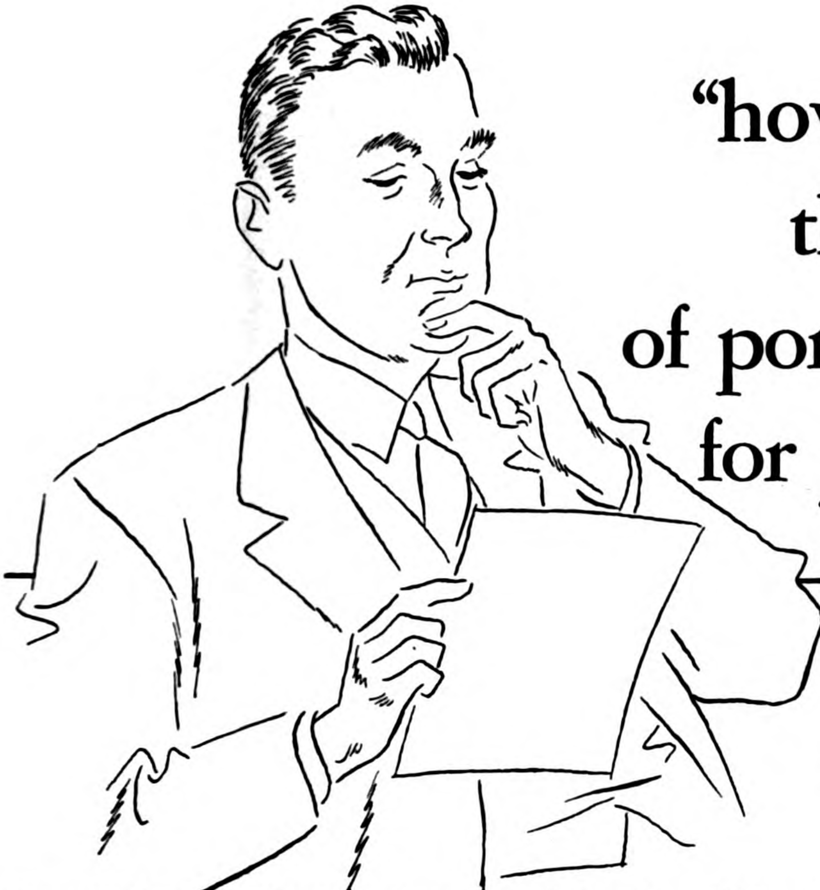
Sales Offices in Principal Cities

MAHR MANUFACTURING CO.

DIVISION OF DIAMOND IRON WORKS, INC.

1710 NORTH SECOND STREET • MINNEAPOLIS, MINNESOTA, U. S. A.

★ *Buy MORE War Bonds!* ★



"how to determine the right type of portable power tools for *your* operations"

BASIC ADVANTAGES
of the Three Types of Portable Power Tools

There are three *types* of portable power tools — Pneumatic . . . Universal Electric and High Frequency Electric.

Each has certain basic design, construction and operating characteristics which make it particularly suitable for certain operating conditions. Broadly, the factors which govern the selection of proper tools are: the *nature* of the work; the *amount* of work; the *material* to be worked and the *service* expected of the tools.

All types of portable tools will help you speed production; *one* type, selected for its particular adaptability to your applications and operating methods, will bring you PEAK production.

THOR is especially well qualified to help you determine which type this is, because:

***Thor* makes all three types of portable power tools.**

***Thor* has the engineering "know how" that comes from building good tools for fifty years.**

***Thor* is working continuously to make the good tools of today even better tools tomorrow . . . to develop new tools for new applications.**

***Thor* has the trained Service Engineers to put this advisory service into practical operation.**

A competent study of your conditions and an *impartial* recommendation of your requirements — including dependable cost estimates and comparisons — will be gladly furnished without obligation. Your inquiry will bring a Thor engineer quickly. Write to the Independent Pneumatic Tool Company, 600 W. Jackson Blvd., Chicago, Illinois.

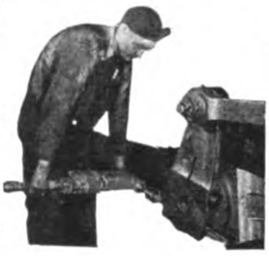
Pneumatic Tools

Available for a wider variety of applications than any other type.

Generally of more rugged construction.

Cannot be damaged by overloading.

Easily stand up under the hardest kinds of heavy duty service.



Universal Electric Tools

Run on ordinary AC or DC electric current which is available almost everywhere.

Offer a wide range of models for all kinds of production and maintenance.

Installation costs generally lowest of all.

High Frequency Electric Tools

Lowest operating costs for users of ten or more tools.

Maintain virtually constant speed under load.

Nature of high frequency current permits simplified construction for light weight, easy handling, reduced maintenance.

Thor
PORTABLE TOOLS

PNEUMATIC • UNIVERSAL ELECTRIC • HIGH FREQUENCY ELECTRIC

Let Thor help you get peak production with the right type of Portable Power Tools

The eyes of all America are upon the United States Treasury Roll of Honor appearing in the "Payroll Savings News." For copy write War Savings Staff, Treasury Department, Washington, D. C.

NEW 10% WAR BOND DRIVES SWELL TREASURY HONOR ROLL

HOW TO "TOP THAT 10% BY NEW YEAR'S"

Out of the 13 labor-management conferences sponsored by the National Committee for Payroll Savings and conducted by the Treasury Department throughout the Nation has come this formula for reaching the 10% of gross payroll War Bond objective:

1. ***Decide to get 10%.***
   It has been the Treasury experience wherever management and labor have gotten together and decided the job could be done, the job was done.
2. ***Get a committee of labor and management to work out details for solicitation.***
   a. They, in turn, will appoint captain-leaders or chairmen who will be responsible for actual solicitation of no more than 10 workers.
   b. A card should be prepared for each and every worker with his name on it.
   c. An estimate should be made of the possible amount each worker can set aside so that an "over-all" of 10% is achieved. Some may not be able to set aside 10%, others can save more.
3. ***Set aside a date to start the drive.***
4. ***There should be little or no time between the announcement of the drive and the drive itself.***
   The drive should last not over 1 week.
5. The opening of the drive may be through a talk, a rally, or just a plain announcement in each department.
6. Schedule competition between departments; show progress charts daily.
7. Set as a goal the Treasury flag with a "T."

As of today, more than 20,000 firms of all sizes have reached the "Honor Roll" goal of at least 10% of the gross payroll in War Bonds. This is a glorious testimony to the voluntary American way of facing emergencies.

But there is still more to be done. By January 1st, 1943, the Treasury hopes to raise participation from the present total of around 20,000,000 employees investing an average of 8% of earnings to over 30,000,000 investing an average of at least 10% of earnings in War Bonds.

You are urged to set your own sights accordingly and to do all in your power to start the new year on the Roll of Honor, to give War Bonds for bonuses, and to purchase up to the limit, both personally and as a company, of Series F and G Bonds. (Remember that the new limitation of purchases of F and G Bonds in any one calendar year has been increased from $50,000 to $100,000.)

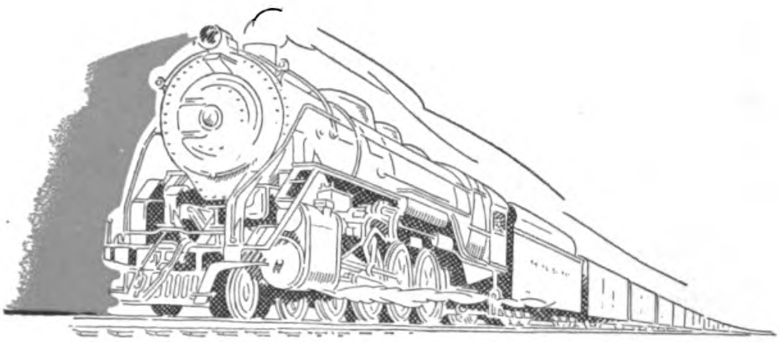
TIME IS SHORT. Our country is counting on you to—

"TOP THAT 10% BY NEW YEAR'S"

EVERYBODY EVERY PAYDAY AT LEAST 10%

Save with War Savings Bonds

This space is a Contribution to America's All-Out War Effort by RAILWAY MECHANICAL ENGINEER



Every new locomotive that is equipped with Timken Bearings * * * * * * * * * * *

Will save (For 4-8-4 type Steam locomotive) 2,438 pounds of copper and 218 pounds of tin, both of which are now so badly needed for other essential war materials * *

And will make possible a 75% increase in locomotive availability. (Averaged records of 6 railroads show that 4 Timken Bearing Equipped locomotives will do the work of 7 similar Friction Bearing locomotives) * *

These same important war-time savings are also available for existing locomotives by converting them to Timken Bearings * * * *

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
RAILWAY ROLLER BEARINGS

BATTLES WON'T WAIT
for the
TRAIN THAT'S LATE!

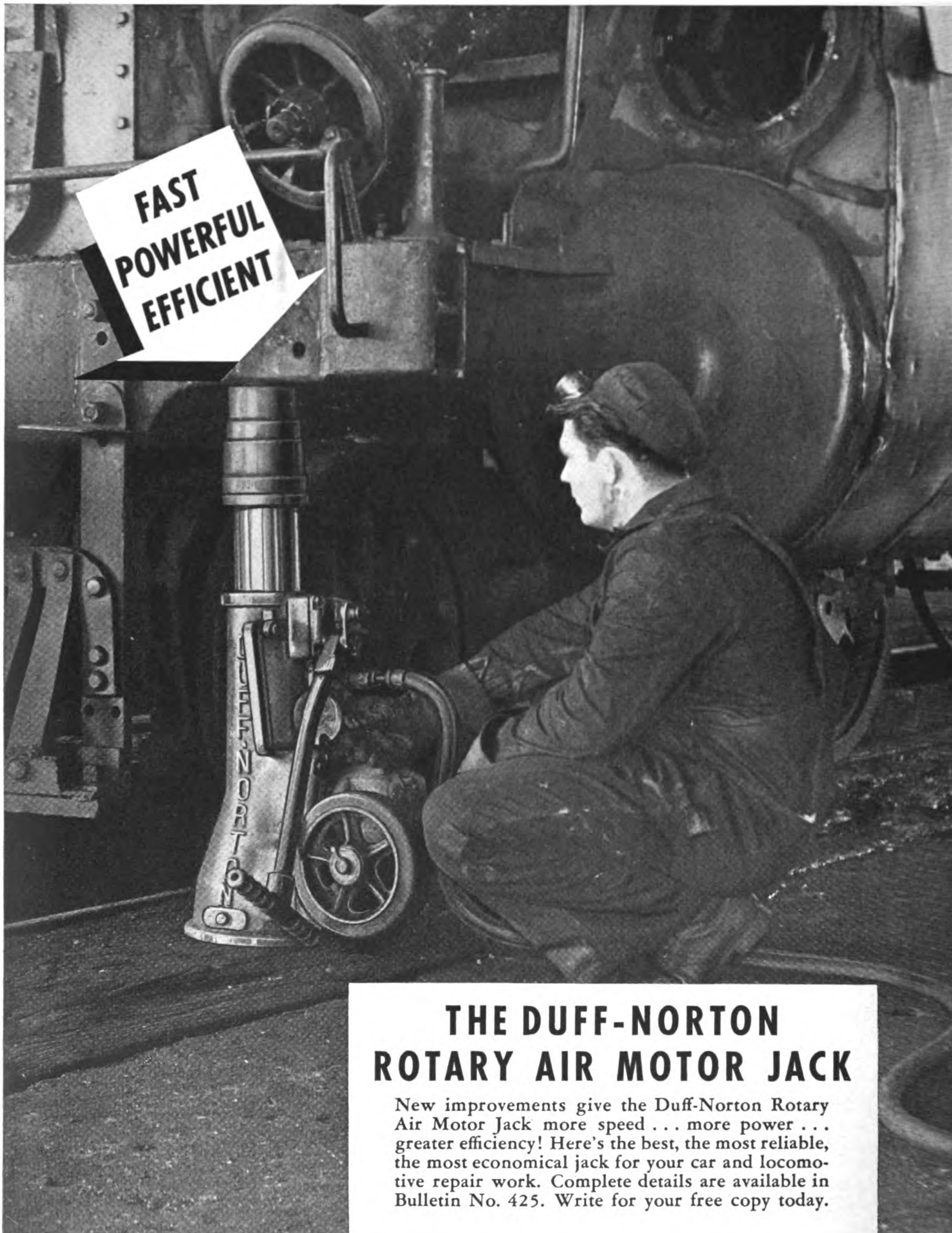
Much vital war transportation depends upon wheels of steel. You can help keep the Victory Drive on schedule by eliminating time out for wheel failures and "shopping." Do this by equipping with ARMCO Stress-Resistant Wheels.

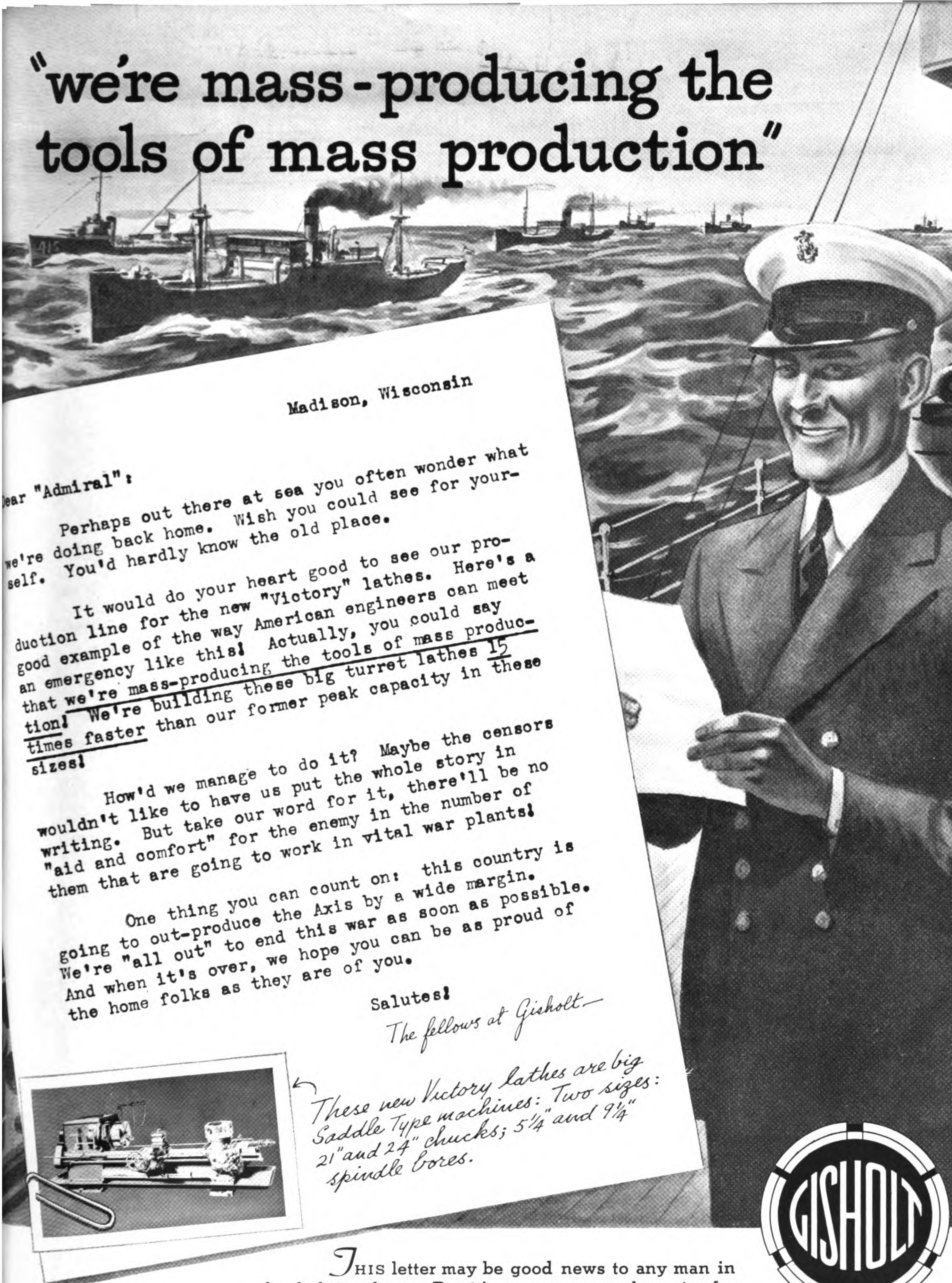
This railworthy wheel stops failure before it starts and does it without losing an inch of mileage performance. One reason is that it *starts* rolling with the lowest possible internal stress. It strongly resists stresses built up in service and has 3 to 4 times more resistance to thermal cracking than any other wheel. In a unique wheel testing machine, as well as in actual service, the Stress-Resistant Wheel has demonstrated its ability to withstand conditions much more severe than any other wheel ever withstood. A special ARMCO process assures easily machinable hubs—permits a true, taperless bore.

Ask us about delivery promises, based on your priority rating. Meanwhile, we will gladly give you all the data you wish on the application of ARMCO Stress-Resistant Wheels to specific service requirements. Armco Railroad Sales Co. Incorporated, 2211 Curtis Street, Middletown, Ohio.

ARMCO

ARMCO STRESS-RESISTANT WHEELS


FAST
POWERFUL
EFFICIENT
DUFF-NORTON



THIS letter may be good news to any man in the fighting forces. But it's even more to the point for the man trying to increase production capacity in vital war plants.

Proper Welding Accessories and Increase Production

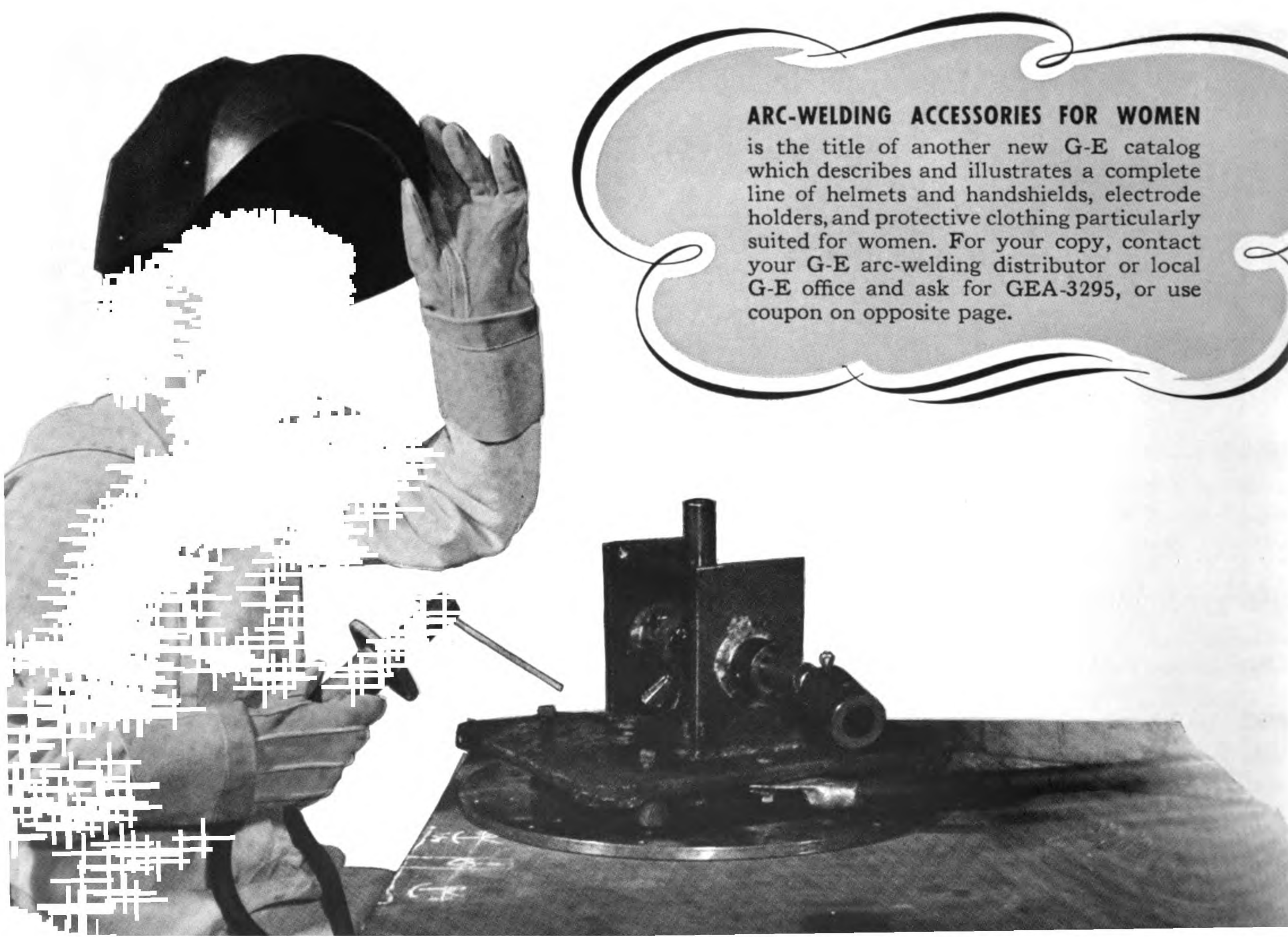
Select yours from this new G-E catalog — — — describes and illustrates more than 100 items

THIS new 32-page G-E catalog is more than a mere listing of products—it is a complete, up-to-the-minute reference book on all important arc-welding accessory items. Profusely illustrated throughout, it contains a wealth of important information.

Designed for quick, easy reference, this catalog contains complete, detailed descriptions of every standard accessory used by arc-welding operators. Full buying specifications, prices, and four sets of convenient order blanks are also included.

Proper arc-welding accessories do more than assure safe, comfortable operation—they help speed up production by providing better working conditions and reducing the time lost in making adjustments of equipment.

For this reason, every operator, every supervisor and foreman, should study this new G-E catalog carefully. For your copy, simply ask your G-E arc-welding distributor or local G-E office for GEA-2704B, or use coupon on opposite page.



Promote Safety

HELMETS AND HANDSHIELDS—
many different types, including the popular G-E ventilated head protectors.

WELDING LENSES AND COVER GLASS—
four standard shades of welding lenses and both treated and untreated cover glass.

PROTECTIVE GOGGLES—
specially designed to protect the eyes against flying slag particles and flashes from other arcs while the helmet is raised.

PROTECTIVE CLOTHING—
made of five-ounce chrome leather for comfort and safety. Aprons, pants, jackets, coats, overall, sleeves, gloves and mittens.

ELECTRODE HOLDERS—
eight selected types of metal electrode holders to meet every need; three types of carbon electrode holders.

BRUSHES AND CHIPPERS—
a number of different styles, including the widely used G-E combination slag chipper with steel brush.

WELD-SPATTER RESISTANT—
an easily-applied liquid that prevents the adhesion of weld spatter.

MISCELLANEOUS—
cable connectors, welding clamps, electrode carriers, arc-welding cable, weld gage, ultra-violet-ray protective paint, etc.

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment

SEND FOR THIS CATALOG TODAY

GENERAL ELECTRIC, Section R673-44
Schenectady, N. Y.

Please send me, without obligation, the catalog checked below

☐ Arc-welding Accessories, GEA-2704B

☐ Selected Arc-welding Accessories for Women, GEA-3295

ORGANIZATION ____________________

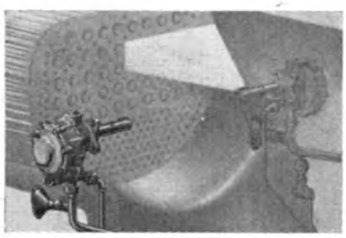
YOUR NAME ____________________

ADDRESS ____________________

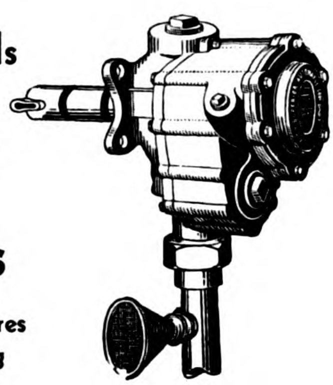
CITY ____________ STATE ____________

GENERAL ELECTRIC

A SIMPLE TWIST
KEEPS FLUES and FLUE SHEETS
Clean!



SET NEW
Performance Records
WITH
SUPERIOR
Automatic
Soot Blowers



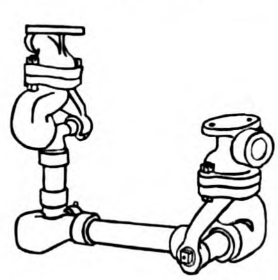
- Maintain Steam Pressures
- Reduce Hand Cleaning
- Assure Longer Runs
- Keep Locomotives Active

Records of tests and case histories prove that steam locomotives equipped with Superior Soot Blowers travel farther, faster and pull heavier loads with greatly reduced maintenance time.

If plastered and honeycombed combustion surfaces are robbing your motive power of its maximum efficiency, install Superior Automatic Soot Blowers today.

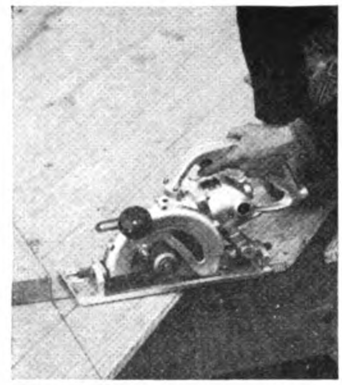
SUPERIOR AUTO-TITE ROLL-or-FLEX JOINTS

Provide undiminished passage of steam, air, water, gases and liquids from source to point of delivery. Easily and quickly installed and a minimum of maintenance required.



BUY MORE WAR BONDS

SUPERIOR RAILWAY PRODUCTS CORP.
7501 Thomas Boulevard, Pittsburgh, Penna.



Fast

and

Safe

as a Railroad

TRADE STANLEY MARK

STANLEY ELECTRIC TOOLS

Stanley Electric Tools stand alone in speed, convenient handling and time saving features. Ask for specification sheets. Stanley Electric Tool Division, The Stanley Works, 160 Elm St., New Britain, Connecticut.

Have You Changed Your Address?

Notice of change of address of subscribers should reach the office of *Railway Mechanical Engineer,* 30 Church St., New York, ten days in advance to insure delivery of the following issue to new address. In sending notification of change always include the old address as well as the new.

Name ....

Old Address ....

New Address ....

Position .... Company ....

THE EDITOR'S DESK

YEAR-END MUSINGS

At long last the tide is turning and the Allies are taking the offensive on all fronts. It is true that a tremendous task yet remains to be done and that it will undoubtedly entail great sacrifices on the part of all our people. Nevertheless, a suffering world is greatly heartened by the new turn of events.

We are now beginning to see the results of the successful mobilization of a great war machine by the Allies, including the production of war supplies and armament on a really gigantic scale. The railways of this country and Canada have acquitted themselves magnificently, with a minimum of new equipment and facilities. All records in handling traffic have been broken and the prospects are that a still greater amount must be moved during the coming year.

Director Eastman of the ODT and President Pelley of the AAR have both pleaded earnestly for more new equipment and for adequate materials with which to maintain the equipment and facilities now in service. Railroaders were not particularly well pleased with the announcement of the proposed release of material for new equipment during the first quarter of 1943, but are hopeful of receiving more consideration later on. Even if some of the optimists prove right and Hitler is crushed next year, the railways will still have to handle a record business during the reconstruction period, and while war continues to be waged in the Far East. For this they must be adequately equipped.

The railroads are not now getting all the materials and equipment they believe necessary, because those responsible feel that other requirements are more pressing and that the railroads can continue to carry on successfully, with reduced services to civilians.

The powers that be have been none too friendly to the railroads over the years. It will be too bad if now when the roads are making such a splendid contribution to our nation's war activities, our people should resent inconveniences to which they may be subjected and over which the railroads have no control because of the lack of equipment.

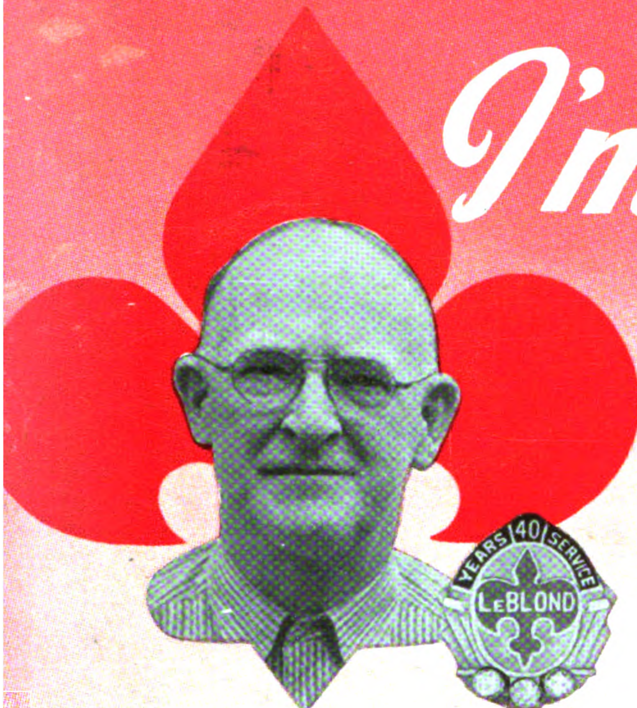
Now is the time for every railway employee to do his full part, not only in facilitating the movement of traffic, but also in helping to educate the public about the part the railroads are playing to help win the Victory. Every employee should also be on the alert to extend whatever courtesies possible to the public and to cultivate more cordial public relations. This will mean much to the railroads when peace returns and conditions become more normal.

Roy V. Wright

I'm Tellin' You...

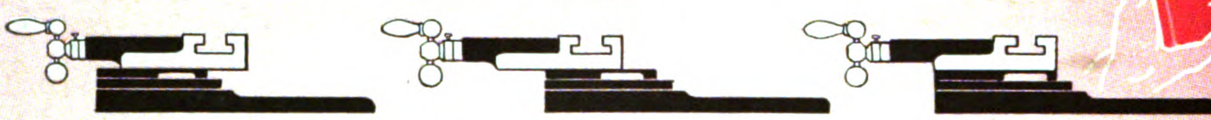
No. 4 in a series of tips on "Keeping 'em Turning"

by George Whitehouse, 41 years at LeBlond's



Lots of new lathe hands figure that rough turning is a kind of hacking process that doesn't call for much brain work. It's probably true that roughing isn't as much of a trick as finishing, but there are some important do's and don'ts. Here's some dope that you will want to remember.

1 POSITION OF COMPOUND REST FOR ROUGH CUTTING



This is wrong. Slide overhangs too far to right. Might break in middle of tee slot.

This is wrong, too. Slide overhangs to left. Also could break in middle of tee slot.

This is right. When making heavy cuts, top slide should be flush with bottom slide so all metal is in compression.

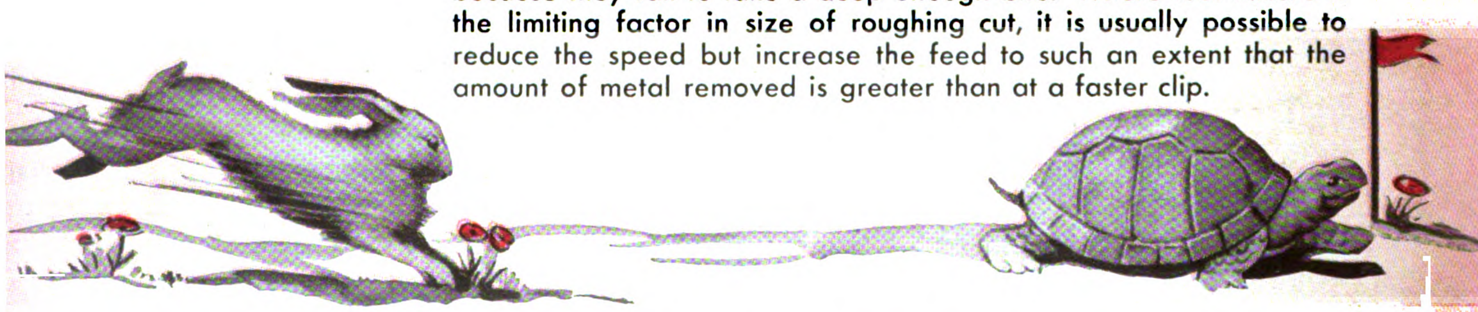
KIND OF MATERIAL	CUTTING SPEED Ft. per Min.	DEPTH OF CUT Inch.	RATE OF FEED Per Rev.
CAST IRON	210	3/8	0.062
SEMI-STEEL	280	1/8	0.012
TOOL STEEL	140	1/2	0.020
BRONZE	425	3/16	0.024
BRASS	458	3/32	0.108
ALUMINUM ALLOY	570	1/8	0.031

CUTTING SPEEDS

When using carbide type tools, these figures are as good as any for a general guide. The rigidity of the machine and tool support, interrupted cuts, etc., will make experimentation and adjustments desirable.

SLOW DOWN AND FINISH SOONER . . . .

There is a tendency for many lathe operators to work their machine far below top efficiency because they fail to take a deep enough bite. Where tool failure is the limiting factor in size of roughing cut, it is usually possible to reduce the speed but increase the feed to such an extent that the amount of metal removed is greater than at a faster clip.



THE R. K. LeBLOND MACHINE TOOL COMPANY

CINCINNATI, OHIO

rgest Manufacturer of a Complete Line of Lath